

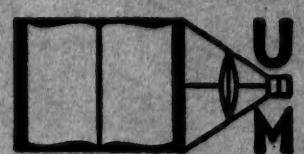
Vol. XVI

No. 8

# DISSERTATION ABSTRACTS

*ABSTRACTS OF DISSERTATIONS AND  
MONOGRAPHS IN MICROFORM*

UNIVERSITY MICROFILMS  
ANN ARBOR, MICHIGAN: 1956



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## INTRODUCTION

This year for the first time *Dissertation Abstracts* will carry, as the 13th issue of Volume XVI, an index to all doctoral dissertations published in the United States and Canada. This issue will be titled *Index to American Doctoral Dissertations*, and will be a continuation of *Doctoral Dissertations Accepted by American Universities*.<sup>1</sup> The joining of these two reference works makes it possible for librarians to have an integrated bibliographical research tool relating to doctoral dissertations under one cover.

*Dissertation Abstracts* will continue to provide abstracts of dissertations by recipients of doctoral degrees from graduate schools cooperating with University Microfilms in the publication of complete dissertation texts on microfilm, on Microcards, or as microprint. At the end of each abstract will be found an indication of the number of pages in the original typescript and the Library of Congress card number, for the convenience of scholars and research workers. In some instances *Dissertation Abstracts* will be found to be an adequate substitute for the published dissertations.

The *Index to American Doctoral Dissertations* will be a complete indexed listing of dissertations by students who were granted doctoral degrees during the previous academic year, and including those abstracted in *Dissertation Abstracts*, arranged by degree-granting institutions under appropriate subject headings. An alphabetical author index will be included.

The tabular material which has been an established part of its predecessor volume will be included in full, so arranged that statistical summaries can be maintained with no break in continuity.

It is hoped that those who use *Dissertation Abstracts* will continue to make suggestions for its improvement, as these are vital to its continued life and growth. Several suggestions for changes in the headings used for indexing purposes have been received, and a committee of the Association of Research Libraries is reviewing the indexing system at the present time as a result of these suggestions.

<sup>1</sup>Arnold H. Trotier and Marian Harman, (eds.), *Doctoral Dissertations Accepted by American Universities*. (New York: H. W. Wilson Co., 1933-1955.)

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## AGRICULTURE

### AGRICULTURE, GENERAL

#### AN EXPLORATORY INVESTIGATION OF THE SOILS AND AGRICULTURAL POTENTIAL OF THE SOILS OF THE FUTURE FEDERAL DISTRICT IN THE CENTRAL PLATEAU OF BRAZIL

(Publication No. 16,254)

Reeshon Feuer, Ph.D.  
Cornell University, 1956

The objectives of this investigation were to determine kinds of soils, distribution of laterite and its relationships to soils, to prepare a reconnaissance soil map and to assess the agricultural potential of the 19,000 square mile Future Federal District in the Central Plateau of Brazil, some 550 miles northwest of Rio de Janeiro.

Soils, laterite and their interrelations were studied in the field. Soil samples, collected by genetic horizons, were studied at Cornell University; detailed descriptions of soil profiles and laboratory results are presented and discussed.

Unique methods were used in preparing the soil map. Field delineation of soils and laterite in relation to land form, on photo mosaics, resulted in "strip" maps along widely spaced traverses. Transparent overlays of the maps provided the photo interpretation team, by superimposition on identical mosaics, with basic information for correlation of photo features with observed soil, laterite and land form conditions, enabling interpretive delineations in areas not observed in the field.

Interviews with farmers and agricultural research workers, visits to farms and experimental fields, field observations in the District and nearby states, and laboratory studies of the soils, furnished bases for estimating the agricultural potential of the area and of specific soils.

The District has an annual mean temperature of 70° F. with little seasonal but a large diurnal variation. Annual rainfall averages 70 inches; with a "strong dry" winter season of 5 months. Elevations are 2,300 to 3,650 feet. Evidence is presented to support the hypothesis that the District is a multi-cyclic uplifted peneplane; three distinct land surfaces were identified and designated as "first," "second," and "third" erosion surfaces; probably of mid-Tertiary, end-Tertiary and Quaternary ages respectively. Laterite is absent on the "third," uncommon on the "second" and largely restricted to margins as a nearly continuous narrow "edge" on the larger remnants of the "first" erosion surface (chapadas), and capping buttes and narrow divides of the latter surface. A deep sendentary regolith, deepest on the first surface, occurs on various kinds of gneiss, schist and sedimentary rocks, except quartzite and silica cemented sandstones; the regolith is thin in lithosolic areas.

Humic Latosols, the major "zonal" soil, occupy 40 per cent of the District; Lithosols 50 per cent; Concretionary Lixosols 5 per cent; and Sand Latosols, sandy Humic

Latosols, sandy Red-Yellow Podzolics, Low Humic Gleys, Bog, Alluvial and sandy Ground-Water Laterite soils the remaining 5 per cent.

It is proposed that different "families" of Humic Latosols might be distinguished on the basis of intensity of weathering; properties of soils from similar rocks on land forms of different age suggest this possibility. The degree of depletion and conversion to clay of primary alumino-silicate minerals in these soils appear to be related to (1) age of land surface, (2) initial content of these minerals in the rocks and (3) post-uplift erosional rates. The following changes in soils occur from the first to the second to the third erosion surface, on rocks of high initial primary alumino-silicate content: clay decreases; dominance of clays by hydrous oxides decreases; cation exchange capacities increase; percentage base saturation increases; and weatherable primary alumino-silicates increase.

Native vegetation correlates with certain soil characteristics and erosion surface; it is a reliable indicator of native fertility under low levels of soil management but not of productivity under high levels of management.

The Humic Latosols of the District have favorable physical properties and slopes but poor chemical properties. The potential of Humic Latosols under high levels of management appears to be much greater than is generally supposed.

Observations of soils in nearby states are recorded.

444 pages. \$5.55. Mic 56-2050

### EFFECT OF SOIL CONDITIONERS ON CROPS AND SOILS

(Publication No. 16,679)

Robert Melvin Holmes, Ph.D.  
Rutgers University, 1956

Vegetable soils of New Jersey are usually sandy in texture and quite often have poor structure. If soil conditioning chemicals could be used to improve the structure of these soils rather than the costly and time-consuming practice of cover cropping, or green manuring, it would be a boon to farmers. An attempt was therefore made to determine the value of soil conditioners if used in this capacity. These chemicals were evaluated in terms of their effect on the composition and yields of crops, and the effect on the soil physical conditions. The mechanism of reaction of soil conditioners is obscure, so an effort was made to clarify the problem. To achieve these purposes the following program was followed:

1. The effect of conditioner chemicals on the yields and composition of various crops was determined in both field and cylinder trials.
2. The effect of conditioner chemicals on aggregate



produce snap beans, tomatoes and broccoli were; 140, 125 and 100 respectively; preharvest hours per acre were 15, 35 and 32 for each crop respectively. Sweet corn is nearly completely mechanized; only five hours are used for pre-harvest work.

A cost of production schedule, for use in estimating costs and returns from vegetable crop production is presented. Through its use farmers can compare alternative courses of action and better formulate future production plans. A revised method of computing work unit requirements, which essentially eliminates migrant labor from harvesting is presented.

Only general statements can be made on New York's competitive position. Broccoli is a new crop, intensive in its use of resources and requires much "know how" in its insect control program. As growers gain more experience, yields and profits are expected to increase. Broccoli acreage in New York is expected to remain stable or increase. Neither sweet corn prices or yields are likely to increase nor are production costs likely to decrease relative to other competing crops. The downward trend in acreage therefore, due to better alternative use of resources, is likely to continue. Due mainly to good yields and prices above the U.S. average, commercial tomato growers made good returns and seem to have a good competitive position. The acreage grown by non-commercial growers is expected to decline. The large scale efficient operations, the trend toward more irrigation, the imminent possibilities of mechanical harvesting, and the development of higher yielding varieties of snap beans, all make the competitive position of New York snap bean growers look good.

333 pages. \$4.30. Mic 56-2052

#### AGRICULTURE, ANIMAL CULTURE

##### THE MEASUREMENT OF FRESH BEEF MUSCLE COLOR CHANGES BY DISK COLORIMETRY

(Publication No. 16,746)

Marvin Mathias Voegeli, Ph.D.  
Michigan State University, 1954

The color of lean beef is subject to change during storage. This is due to the pigment hemoglobin and or myoglobin which is a complex and relatively unstable compound. Immediately after making a retail cut of meat, its color has been described as being dark red or purple. Exposure of the meat to the oxygen in the atmosphere results in the color changing to a desirable bright red color. With continued exposure to oxygen, this color slowly darkens and becomes an undesirable brownish color.

Consumers are very critical of the color of meat and discriminate against meat cuts that do not meet with their individual standard. The self-service style of meat retailing has increased the importance of a desirable meat color. By this method each package is its own salesman and unless a desirable color can be maintained sales suffer.

Since the consumer recognizes the range in beef color,

his preferences are projected into the standards for grades of meat. Descriptive terms such as dark red or light red are used in the standards. These terms are difficult to apply as different individuals may have varied conceptions of the color described.

With these points in mind the object of this investigation was twofold: 1. To present a method for the objective measurement of beef color; 2. To measure the color changes as affected by various treatments.

Steaks were cut from the longissimus dorsi muscle of beef to be measured for color. All color measurements were made in a matching booth under constant illumination by use of Munsell disks of known color notation. The sample and disk mixture were viewed by means of an optical eyepiece mounted in the top of the booth which brought the sample and disk mixture into a juxtaposition in a divided field. The color was matched by altering the disk mixture. By knowing the percent of each disk required to make the color match it was possible to calculate the Munsell hue, value, and chroma of the meat sample. This resulted in an objective measurement of the sample color.

Color differences were found in the longissimus dorsi muscle of different animals and in different areas of any single muscle.

The color of samples changed most rapidly during the first two hours of storage. Subsequent changes occurred more slowly depending upon the conditions of storage.

Samples wrapped in Du Pont 300 MSAT #80 Cellophane maintained a salable color longer than unwrapped samples. Allowing a blooming period before wrapping did not extend the salable storage life compared with samples wrapped immediately.

Intensities of light did not affect the rate of color change while sources of light did.

Freezing and thawing of the rib portion reduced the salable storage life of subsequently cut and wrapped samples while aging the rib portion did not alter the rate of the color change.

152 pages. \$2.00. Mic 56-2053

#### AGRICULTURE, PLANT CULTURE

##### A STUDY OF MAGNESIUM DEFICIENCY CHLOROSIS IN CERTAIN VARIETIES OF GREEN CELERY

(Publication No. 16,249)

Howard William Burdine, Ph.D.  
Cornell University, 1956

Certain varieties of green celery exhibit a chlorosis typical of lack of magnesium in many locations on New York peat soils. It had already been shown that this chlorosis may be due to magnesium deficiency and that it is inherited as a single recessive factor.

Quick tests on many peat samples indicate adequate amounts of available magnesium in these soils. Available calcium is also very high, and standard grower practice is the use of large amounts of potassium. Consequently a differential variety response to a calcium or potassium-magnesium relationship was hypothesized rather than an

actual magnesium deficiency in the soil solution.

Preliminary experiments with modified Hoagland's No. 2 solution indicated that 1 me Mg/liter was a magnesium level in which two chlorotic varieties, Utah 10-B and Emerson Pascal, would show considerable chlorosis, while Summer Pascal, a nonchlorotic variety would show little or no chlorosis.

A factorial experiment in which two nonchlorotic varieties, Utah 15 and Summer Pascal, were compared to two chlorotic varieties, Utah 10-B and Emerson Pascal, was conducted in sand culture with modified Hoagland's No. 2 solutions. Potassium was supplied at 2, 4 and 6 me/liter. Calcium was supplied at 4, 8 and 12 me/liter. These materials were used in all combinations with magnesium supplied at 1 me/liter. This experiment failed to demonstrate any decisive differences within varieties in response to treatment. Between all treatments the large differences were between chlorotic and nonchlorotic varieties. Differences between replications indicated that some environmental factor, possibly root temperature or light, influenced response by chlorotic varieties resulting in differences between replications greater than any differences due to treatment.

In another factorial experiment the same varieties were used. Cations were held constant while nitrates were varied at 8 and 16 me/liter and sulfates were varied at 1 and 4 me/liter in modifications of Hoagland's No. 2 solution. Chlorotic varieties gave a significantly greater response to higher nitrate levels, while differences in response between chlorotic and nonchlorotic to sulfate levels were not significant.

Root systems were weighed for all plants grown in solution and sand culture and a top/root ratio calculated. For all varieties, decreasing the magnesium levels increased top/root ratio. However, nonchlorotic varieties invariably had a larger root system in relation to top under the conditions of the experiments.

Roots, stems, petioles and leaves were analyzed for potassium, calcium and magnesium for one nonchlorotic variety, Summer Pascal and two chlorotic varieties, Utah 10-B and Emerson Pascal. These plants were grown in nutrient solution of modified Hoagland's No. 2 solution with magnesium levels of 4.0, 1.5, 1.0 and 0.5 me Mg/liter. Stems contained more magnesium than any other plant part at any one level of magnesium, followed by petioles, leaves, and roots containing the least. As magnesium levels were decreased, the magnesium content of all plant parts were drastically reduced. Magnesium in the roots of chlorotic varieties at the lowest level of magnesium was some higher than the nonchlorotic variety. In the stems the large differences were between the two chlorotic varieties. Magnesium in petiole and leaves was higher in the nonchlorotic variety. The nonchlorotic variety seemed to have greater ability to absorb the magnesium it required from the nutrient media.

Field experiments indicated that foliar applications of 2 to 3 per cent  $MgSO_4 \cdot 7H_2O$  at one to two weeks' intervals during the last 60 to 70 days of the growing season were the most feasible means of control of the chlorosis.

250 pages. \$3.13. Mic 56-2054

## THE EFFECT OF FORAGE MANAGEMENT ON A SUBSEQUENT SUGAR BEET CROP

(Publication No. 16,741)

Milton Harlan Erdmann, Ph.D.  
Michigan State University, 1954

A forage-sugar beet experiment was conducted involving eight different forage species and mixtures, three rates of fertilizer application on the forages, hay both removed and left on the plots, and sugar beets planted on the area following the plowing down of the forage. Additional fertilizer was applied with the beets on one-half of each original forage plot.

The forage species and mixtures tested differed widely in yielding ability, with the legumes and legume-grass mixtures giving greater yields than the grasses alone. All of the forage species and mixtures showed a marked response in yield to applications of fertilizer. The average yields of sugar beets following the various forage species and mixtures did not differ greatly, but fertilizer applied on the forages definitely affected the yield of sugar beets two years later. Whether the forage was removed from the plots or not had little effect on beet yields. Fertilizer applied on the forages resulted in beet yields equivalent to yields where the same amount was applied directly on the beets. The application of 800 pounds of 3-9-18 fertilizer per acre directly on the sugar beets produced substantial increases in beet yields.

The number of marketable beet roots per acre was increased only where fertilizer was applied on the forages or directly on the beets. Forage species and mixtures had a greater effect on sucrose percentages than did fertilizers. However, fertilizer applied either on the forages or directly on the beets had a greater effect on the pounds of sucrose produced. 39 pages. \$1.00. Mic 56-2055

## SOIL AND PLANT MANGANESE STUDIES WITH SOYBEANS.

### I. CHEMICAL ESTIMATION OF AVAILABLE SOIL MANGANESE.

### II. METHODS AND MATERIALS FOR CORRECTING MANGANESE DEFICIENCY.

(Publication No. 17,389)

Donald Jerome Hoff, Ph.D.  
The Ohio State University, 1956

The relationship between manganese absorbed by soybean plants and manganese extracted from the soil by several chemical methods was investigated. As an estimate of plant-available soil manganese, extraction with ammonium dihydrogen phosphate was significantly superior to extractions with sulfuric acid, nitric acid, hydroquinone in ammonium acetate, and sodium acetate. Extractions with ammonium dihydrogen phosphate, phosphoric acid, and alcoholic hydroquinone were not, in themselves, statistically different, but as a group were significantly better than sodium acetate extraction or exchangeable or total manganese in estimating plant-available soil manganese.

The correction of manganese deficiency with foliar and soil-applied manganese was investigated under field and

greenhouse conditions. Manganese sulfate row applied at 30 lb. per acre or fertilizer row applied at 200 lb. per acre was effective in correcting manganese deficiency. Manganese in fritted form (FN-239-B) was less effective than manganese sulfate. Fertilizer greatly enhanced the availability of manganese in sulfate form but had little effect on the availability of manganese in fritted form. Low solution volumes of foliar-applied manganese sulfate were effective in correcting manganese deficiency. Foliar-applied manganese sulfate increased the manganese content of soybean plants 30 to 40 fold in the first hour, and from 10 to 15 per cent of the manganese applied was absorbed in the first hour.

87 pages. \$1.50. Mic 56-2056

#### EFFECTS OF CERTAIN ENVIRONMENTAL FACTORS ON TOXICITY OF MANGANESE IN TOMATO PLANTS GROWN ON STEAMED SOILS

(Publication No. 17,391)

Monroe Cornealeous Lutrick, Ph.D.  
The Ohio State University, 1956

Partial sterilization of soil by steaming is commonly practiced by commercial greenhouse tomato growers as a means of controlling soil-borne pathogens. Although the method provides effective disease control, plants grown in previously steamed soil frequently grow slowly and become chlorotic and necrotic. This undesirable effect of soil steaming on plant growth is frequently referred to as sterilization injury.

The effect of soil temperature, phosphorus fertilization, soil pH, and light intensity on sterilization injury in tomato plants was studied under greenhouse conditions.

Foliar symptoms of manganese toxicity in tomato plants were found to be identical with foliar symptoms of sterilization injury. The severity of sterilization injury in tomato plants grown on previously steamed soils increased with an increase in exchangeable soil manganese after steaming. The level of exchangeable manganese present in the soil after the steam treatment was positively correlated with the total manganese content of the soil. Spectrographic analysis of plant material showed that trace elements other than manganese did not change appreciably as a result of soil steaming. Foliar symptoms of manganese toxicity were not apparent under low light intensity, although the concentration of plant manganese was equal to the concentration found in injured plants grown under normal light intensity. An increase in soil temperature increased the rate of plant growth, decreased the severity of injury, and decreased the plant manganese concentration by dry-matter dilution. The application of phosphate to the soil also aided in reducing sterilization injury. Increasing the pH decreased exchangeable soil manganese and plant manganese. The interaction between soil temperature and soil pH was significant.

77 pages. \$1.50. Mic 56-2057

#### EFFECTS OF MANGANESE NUTRITION OF HIGHER PLANTS ON GROWTH, IRON-PORPHYRIN ENZYMES, OXALACETIC ACID DECARBOXYLATION, INDOLE ACETIC ACID INACTIVATION AND ASCORBIC ACID CONTENT

(Publication No. 16,697)

Jules Pointre Winfree, Ph.D.  
Rutgers University, 1956

Review of current literature reveals that we may group into two broad types the catalytic actions exerted by Mn as an essential element in higher plant nutrition. These are: (1) Postulations that Mn is required by specific enzymes involved in plant metabolism, and (2) the possibility that *in vivo* levels of Mn affect enzymes or enzyme systems of known cationic composition in a manner that does not require Mn as an integral part of the enzymes themselves.

While Mn has been shown to be required for maximal catalytic activity of certain enzymes isolated from plant tissues, it remains to be proven that Mn cannot be replaced, *in vivo*, by other cations. Likewise, indirect effects of Mn on enzyme systems that require other metals are still rather vague.

Nevertheless, Mn has been regarded essential to metabolic equilibria associated with oxidation-reduction, CO<sub>2</sub> fixation, hormone balance and vitamin content.

This study was initiated as part of a broad trace element research program to investigate further some of the phenomena observed during previous work with Mn as an element of plant nutrition.

Hawkeye soybeans for maturity and seedling experiments were grown in highly purified nutrient solutions. Sand-grown Rutgers tomatoes receiving purified solutions furnished ripe fruits for ascorbic acid assays.

Biochemical methods for enzymatic activities, nitrogen fractions, reagent preparations, and ascorbic acid determinations were according to standard, published outlines with some slight modifications.

Hawkeye soybeans were grown to maturity in nutrient solutions containing adequate (0.100 and 0.250 ppm.) and deficient (0.005 and 0.020 ppm.) Mn concentrations.

Yields and oil contents of mature beans and dry weights of stems, petioles, and roots were markedly reduced when Mn supply was low. Oil content of soybeans produced on plants receiving 0.005 ppm. Mn was approximately one-half that of those from plants receiving 0.020 to 0.250 ppm. Average size and weight of the low-Mn beans were much lower and total N content was much higher than of beans produced at higher levels of Mn nutrition.

Additional experimental evidence further indicates that carefully controlled Mn nutrition of higher plants may produce changes in fundamental metabolic behavior that are measurable and reproducible.

The Fe-porphyrin enzymes catalase and cytochrome oxidase respond to Mn levels of nutrition in an inverse manner, though perhaps not through similar mechanisms. These enzymes are not affected, however, to the same relative degree by high or low Mn that growth and yields may be influenced. Conversely, in certain cases effects of altered Mn nutrition may be reflected by enzymatic activities before visible differences become apparent. Certainly severe or prolonged Mn deficiency effects are difficult to relate to a single sequence of chemical reactions,

since plants probably require this element in many fundamental processes.

Mn may be the predominate cation associated with an oxalacetic acid decarboxylase of Hawkeye soybean leaves, though it was not possible to separate completely enzymatic decarboxylation from the non-enzymatic in crude preparations, at least not in time to permit investigation of the significance of Mn nutrition on the two types of decarboxylation. The possibility that Mn may be responsible for control of  $\text{CO}_2$  fixation through its influence on both enzymatically and non-enzymatically catalyzed reactions is certainly worthy of further investigation.

Mn appears to affect hormone (indole acetic acid) balance of Hawkeye soybeans through a direct effect on peroxide generation. Metabolically generated peroxides, in-

creased in concentration in root tissues at high levels of Mn nutrition, presumably lead to a high oxidation of indole acetic acid.

It was shown that Mn nutrition of sand-grown Rutgers tomatoes was reflected in ascorbic acid contents of the ripe fruits produced. In addition Fe may also play a role in metabolism of the vitamin. Fe-Mn relationships may be the actual controlling factors. Further research will be required to clarify the situation regarding nutritional effects on ascorbic acid. Certainly, development of suitable production techniques, concurrent with evolution of precise control methods in trace metal nutrition, have been shown to provide nutritionally affected edible products which may be accurately analyzed for their ascorbic acid contents.

82 pages. \$1.03. Mic 56-2058

## ANATOMY

### CERTAIN ANATOMICAL AND FUNCTIONAL INTERRELATIONS BETWEEN THE TEGMENTUM OF THE MIDBRAIN AND THE BASAL GANGLIA

(Publication No. 17,421)

Joshua Harlan Carey, Ph.D.  
University of Michigan, 1956

This study is concerned with the experimental production of tremor, hypertonicity or rigidity and loathness to move by stimulation or destruction of appropriate areas in the brain of the macaque. The areas investigated were the tegmental portions of the midbrain including the red nucleus, the nucleus ventralis lateralis, the globus pallidus and the orbital and temporal regions of the cerebral hemisphere.

The animals used for the experiments were medium-sized *Macaca mulatta* and *Macacus cynmologus*. The deep stimulations and destructions were made by use of the stereotaxic apparatus (McCulloch modification). The cortical regions to be ablated were exposed by craniotomy and the tissue removed by use of a sucker. The anesthesia employed was ether and all operations were performed with the use of sterile technique. Careful pre- and post-operative testing was carried out. At the time the animals were sacrificed, they were perfused with ten to fifteen percent neutral formalin. The brain was removed and examined by gross inspection for any abscess formation and for the location of any cortical lesions. Then the material which was suitably timed was prepared by the Marchi technique and examined microscopically.

An action or intention tremor was obtained on stimulation of the red nucleus, of the tegmental gray lateral and dorsolateral to it (at several rostrocaudal levels) and of the nucleus ventralis lateralis of the dorsal thalamus. Lesions of these areas, particularly when the lesions were bilateral, produced a persistent although less marked tremor.

This tremor resembled closely a cerebellar tremor such as is obtainable with bilateral lesions of the dentate nucleus or the superior cerebellar peduncle. Since this tremor occurs both on stimulation and destruction of the

tegmental areas, its presence appears to indicate an imbalance in the discharge between the cerebellar centers and those of the cerebral hemisphere. In one monkey there was an increase in tremor when lesions were placed bilaterally in the globus pallidus following tegmental lesions. At no time in this series of experiments was it possible to obtain a true resting or non-intention tremor.

A mild hypertonicity resulted when relatively large, bilateral lesions were placed in the globus pallidus. This hypertonicity was increased when the lesion encroached upon the posterior limb of the internal capsule in the region of passage of corticospinal fibers. That marked rigidity did not appear was due, perhaps, to the fact that in no case was there complete destruction of the globus pallidus bilaterally.

Loathness to move, apathy and drowsiness characterize those monkeys with lesions in the globus pallidus which extended ventralward to sever cortico-hypothalamic bundles beneath the pallidum. It appears probable that in patients with a Parkinsonian syndrome the area involved extends below the globus pallidus into the cortico-hypothalamic fascicles connecting temporal and orbital areas of the hemisphere with the hypothalamus. This conclusion was documented, in part, for the monkey by a study of the effect of lesions in orbital and temporal regions of the cortex. With such lesions the monkeys were less alert and slower in their reactions.

67 pages. \$1.50. Mic 56-2059

### OSTEOGENESIS AND OSSIFICATION IN THE POSTNATAL VIRGINIA OPOSSUM, *DIDELPHIS MARSUPIALIS VIRGINIANA* KERR

(Publication No. 15,604)

Carlita Leona Nesslinger, Ph.D.  
Cornell University, 1955

A gross study of bone formation and development was conducted on 234 specimens of the opossum, *Didelphis*

*marsupialis virginiana* Kerr. Specimens from the Cornell University Mammal Collection were used in the study.

Specimens were prepared by clearing in 2% KOH, staining in alizarin red S, final clearing in part glycerine and KOH, and storage in pure glycerine. The development of all parts of the skeletal system was studied and the long bones and crown-rump length were measured to ascertain the rate of growth in the humerus, radius, ulna, femur, tibia, and fibula. Particular attention was given to dentition and ossification of bones of the skull.

The process of ossification is described in six stages covering the period from birth to about 100 days. This includes development in the pouch and during the first month thereafter. The stages of ossification fall into groups as follows:

- 0 to 7 days: no ossification in the hindlimb
- 8 to 14 days: femur, tibia, and fibula 1 to 2 mm. long
- 15 to 28 days: all primary bones of manus digits present

29 to 39 days: digits of pes ossified; 0 to 1 carpals; no tarsals; dental formula:

$$I \frac{0-3}{0-4} C \frac{1}{1} PM \frac{1}{1} M \frac{1}{1-2}$$

40 to 60 days: 3 to 6 carpals; 1 to 3 tarsals; dental formula: I  $\frac{5}{4}$  C  $\frac{1}{1}$  PM  $\frac{1}{1}$  M  $\frac{2}{1-2}$

61 to 85 days: 7 to 8 carpals; 4 to 7 tarsals; dental formula: I  $\frac{5}{4}$  C  $\frac{1}{1}$  PM  $\frac{2}{2}$  M  $\frac{2}{2-3}$

In addition to these major characteristics, the degree of development of all bones is described for each stage.

Specimens of known age, representing five out of the six stages, are used as the index for determination of the age range in the stages. The stages of ossification and development of various bones are illustrated by line drawings and photographs of cleared specimens.

117 pages. \$1.46. Mic 56-2060

## ANTHROPOLOGY

### AN ARCHAEOLOGICAL STUDY OF THE ILLESCAS-JUBONES COAST OF NORTHERN PERU AND SOUTHERN ECUADOR

(Publication No. 16,953)

Ross Taylor Christensen, Ph.D.  
University of Arizona, 1956

Supervisor: Emil W. Haury

A field survey extended from the Illescas peninsula northward along the coast of Peru to the Jubones River valley in southern coastal Ecuador. Stratigraphic excavations were practiced in refuse deposits at Chusís, an ancient ruin near Sechura in the lower Piura valley.

Remains of apparently pre-ceramic cultures were found in the Illescas peninsula and the Cabo Blanco zone.

Attenuated Chavín, Mochica, and Tiahuanacoid influences were seen in the ceramics of the far north coast of Peru. Abundant evidence of the following Chimu period was found, notably in the Chira valley and the upper Piura valley.

The excavations at Chusís revealed a peasant-type culture extending back to an estimated beginning date of 1000 A.D., although in its ceramics it shows affinity with the earlier Negative and White-on-Red traditions. This isolated Chusís (or Sechura) culture seems to have preserved certain archaic traits after they had died out elsewhere. It continued with little change apparently into the Colonial period.

Coastal El Oro, as well as presenting a striking geographic contrast to the desert coast of Peru, contains an equal contrast in culture type. Here, the Manteño culture of Manabí and Guayas appears in full force.

455 pages. \$5.80. Mic 56-2061

### CULTURAL CONTINUITY AND POPULATION CHANGE ON THE ISLE OF SKYE

(Publication No. 17,051)

Paul Richard Ducey, Ph.D.  
Columbia University, 1956

This study is concerned with the effect of population change on the culture of the essentially peasant society of the Isle of Skye, one of the Hebrides of Scotland. Standing on the very fringe of Western Europe, this particular surviving remnant of the once widespread Celtic culture has experienced a familiar consequence of the impingement of the social and economic forces of urban and industrial Western Civilization. Involvement in the process of westernization brought a rapid, accelerating increase in the size of the population. Failure to make the required cultural adjustments led to persistent depopulation. From the many problems created by the swing of the population pendulum, this study singles out one of particular anthropological significance. The thesis is that population change is not necessarily a criterion of cultural discontinuity. Although one case study cannot prove this assertion, future research along similar lines in other cultures marginal to the main stream of Western Civilization may reveal a wider applicability of the thesis. The material presented in the present study was collected during a year of field and library research in 1953 - 1954.

The approach to the problem is oriented toward the culture history of the Skyemen. Following a brief comparative description of the contemporary culture, an attempt is made to reconstruct the culture as it functioned in the days when the clan system was an all-pervading influence in the lives of the people. This is intended to provide the necessary perspective for the ensuing processes of cultural change by revealing the essential features and the form, the distinctive pattern, of the culture. The stage set, four periods of social and cultural change, spanning over two

centuries (1745 - 1953), are reviewed. The purpose is to analyze the extent of acculturation under the influence of the commercial and, later, industrial society of Great Britain. Throughout, emphasis is placed on population change and cultural continuity. Having established the main social and cultural trends, the economic, social, and religious aspects of the present day culture are examined in some detail for an understanding of its continued distinctiveness. The intention is to present not only the evidence for continuity, but also to point out the problems associated with the preservation of a cultural heritage no longer en rapport with the Western World.

The author's conclusions close the study. Despite chronic social instability, economic calamity, and striking changes in content, the culture has persisted and remained recognizable through the years. Although there have been periods of social disorganization and threatened cultural disintegration, irreparable disorganization has not been a characteristic of the culture. Obviously, the culture today is not identical with that of two hundred years ago, but the

essential features which gave the culture its distinctiveness then do so today. Continuity has been preserved through a reintegration. In part, this represents an incomplete adjustment to the more complex sociocultural organization of Great Britain. The Skyemen have remained ensiled geographically and culturally. As in other simple, isolated, kinship oriented societies, an adjustment has been made in the traditional culture. The most important factor in the preservation of continuity has been congregational religion. While Presbyterianism, with its stress on asceticism, has curtailed and modified many characteristics of the culture, it has provided a new focus to replace the clan. Furthermore, it has helped to preserve the essential features of the culture and maintain continuity by sanctioning the values important to the people. The culture is growing old with the people. The deviants, mainly the youth, who will not conform to the traditional values are being rejected. Social instability is a penalty for remaining peripheral to the Western World.

417 pages. \$5.35. Mic 56-2062

## BACTERIOLOGY

### THE EFFECT OF DRUGS ON VARIOUS ASPECTS OF BACTERIOPHAGY

(Publication No. 17,212)

Thomas J. Bird, Ph.D.  
University of Pennsylvania, 1956

Supervisor: Joseph S. Gots

This dissertation is a report on a program, the primary aim of which was to elucidate and add to the available techniques for the dissection of the lysogenic system in *Escherichia coli*, strain K-12. Three experimental approaches to the problem were undertaken. The first approach consisted of an adaptation of the paper-disc method for studying inhibitory action of drugs.

A number of drugs was screened, using the paper-disc method, for their ability to influence the outcome of an infection of a bacterium by a phage particle. Of sixty-six drugs tested for antiphage activity, twenty-eight were found to inhibit one or more of the phages used in the experiments. This inhibition was evident when concentrations of drug which were not inhibitory for the bacterial host cell were employed. One of the 28 phage-inhibitory drugs did not inhibit the bacterial host even at higher concentrations. This compound was a pyrimidine analogue, 2,6-diamino-4,5-dihydroxymethylamino pyrimidine. The action of the amidines was studied further. It was demonstrated that the action of propamidine, pentamidine and stilbamidine occurred after the phage particle had penetrated the host cell.

The second approach was directed toward a study of the phenomenon of induction. Several new radiomimetic chemicals were tested. The lysogenic *E. coli*, K-12, was the test organism. Increase in free phage was determined by plating on *E. coli*, strain C. Induction of phage formation was determined by a turbidometric technique, and by

means of plaque counts to detect an increase in free phage. Ten compounds were found to act as inducing agents in producing an increase in phage liberation in *E. coli*, K-12. Azaserine, an antibiotic with anti-neoplastic activity, was studied in some detail. The inducing action of azaserine was inhibited by phenylalanine, tyrosine and tryptophan.  $\beta$ -2 thienylalanine, a phenylalanine analogue, also inhibited the induction by azaserine but to a lesser degree than did phenylalanine. This inhibition of the inducing action of azaserine was possible only during the first five minutes immediately following exposure to azaserine. Hydrogen peroxide also induced phage liberation in *E. coli*, K-12. This induction was inhibited by the addition of catalase. Catalase had no effect on the induction by azaserine. Possible applications of azaserine as an inducing agent were suggested.

The third approach was designed to obtain new indicator organisms for the various phages to be examined. It was hoped that new indicator organisms might illuminate further some of the biochemical and physical influences on bacteriophagy. Part three of this thesis describes in some detail the nutritional patterns of one such indicator organism. This organism, *E. coli*, strain WM-13, is unique in several respects. It has a temperature-sensitive requirement for either methionine or p-aminobenzoic acid. These requirements are only evident at 37°C. At 25°C, growth of the organism was normal in a chemically defined medium. At 25°C, growth was inhibited by the presence of homocysteine. Methionine or p-aminobenzoic acid antagonized this inhibition. WM-13 is susceptible to the following coliphages: lambda, W, T<sub>1</sub>, T<sub>3</sub>, T<sub>6</sub>, T<sub>7</sub>. When lysogenized with lambda, WM-13 becomes resistant to T<sub>1</sub>. WM-13 lysogenized with lambda is inducible, using ultraviolet irradiation, azaserine, and chloroquine mustard as inducing agents. A hypothesis to explain the temperature sensitive requirements was presented.

49 pages. \$1.50. Mic 56-2063

**THE EFFECT OF HEMOPHILUS PERTUSSIS  
AND ITS LABILE TOXIN ON THE  
PHYSIOLOGY OF THE RAT TRACHEA**

(Publication No. 17,420)

Walter Stewart Callahan, Ph.D.  
University of Michigan, 1956

To study the possible mechanism of H. pertussis infection, (a) ciliary activity of the tracheal epithelium (b) supravital staining capacity of the tracheal epithelial cells and (c) the quantity of respiratory tract mucus, were assayed in rats following infection with H. pertussis or topical application of its thermolabile toxin. The results were compared with similar data obtained from animals injected with Locke solution.

The organisms multiplied in the trachea and bronchi, producing changes not unlike those seen in the human disease. Susceptibility to infection varied inversely with age.

Ciliary activity was determined by measuring the distance travelled per minute by Norite particles placed on the mucosal surface of excised trachea. The supravital staining capacity was determined by microscopic examination of the epithelial cells after 20 minutes contact with Janus green-neutral red mixtures. Mucous secretions of normal and infected rats were recorded as milligrams of material per cm<sup>2</sup> of trachea. The mucin in this material was determined chemically following precipitation with acetic acid and ethanol.

A study of the resistance-lowering properties of mucus was undertaken by incorporating H. pertussis in tracheal mucous secretions and determining ciliary activity and supravital staining reactions in rats injected intratracheally with this mixture. Goblet cell and submucosal gland secretions were tested separately. Complement inactivation by mucus was determined by comparing the complement titer of rat serum before and after addition of the mucus to the serum. The amount of oleic acid bound by the mucus was determined by use of the iodine number method.

The LD<sub>50</sub>/gm animal weight for 180 gm rats injected intratracheally was 5 X 10<sup>5</sup> H. pertussis cells, whereas the LD<sub>50</sub>/gm for 15 gm rats was 4 X 10<sup>4</sup>. Intratracheal injection of approximately 25 X 10<sup>6</sup> H. pertussis cells into rats resulted in reduction in the velocity at which Norite particles were moved across the opened trachea from 4.0 mm per minute to less than 1.5 mm per minute within 72 hours. The number of cells staining supravitally was reduced from approximately 95% to about 65% within 72 hours after the infection was initiated. Under the same conditions, the mucus in the rat trachea increased from 3 mg per cm<sup>2</sup> of trachea to 15 mg per cm<sup>2</sup>. H. pertussis toxin was capable of reducing ciliary activity and the number of tracheal cells staining supravitally only when intratracheal administration was accompanied by local scarification. The toxin had no appreciable effect on mucus accumulation. These effects of H. pertussis and its toxin could not be duplicated in the rat using other human respiratory tract pathogens or their toxic products.

Goblet cell secretions added to H. pertussis cells potentiated the reduction in ciliary activity and supravital staining reactions ascribed to H. pertussis. Potentiation by this mucus was also observed using H. pertussis toxin. Submucosal gland secretions showed no such potentiation unless the mucin was concentrated. Inactivation of com-

plement and binding of oleic acid were greater with the goblet cell secretions, but comparable results occurred using mucin concentrated from the submucosal gland secretions.

It was concluded that the rat may serve as a model for experimental H. pertussis infection. Since ciliary activity and maintenance of a mucous layer are known to be defense mechanisms of the respiratory tract, the observed interference with ciliary activity and increased production of mucus following H. pertussis infection suggest that these constitute part of the mechanism by which this organism initiates and perpetuates the disease process. The unphysiological production of mucus may result not only in mechanical interference with normal respiratory tract defense mechanisms, but may also bind substances inhibitory to H. pertussis, such as complement and oleic acid.

197 pages. \$2.60. Mic 56-2064

**THE ROLE OF L-ALANINE AND GLUCOSE  
ON DORMANCY IN SPORES OF AEROBIC BACILLI**

(Publication No. 17,424)

Brooks Davis Church, Ph.D.  
University of Michigan, 1956

The purpose of this investigation was to examine the role of L-alanine and glucose in breaking dormancy of resting spores in several strains of aerobic bacilli. The mechanism whereby these compounds initiated germination is obscure due largely to our ignorance of the biochemical activities of spores.

An ideal spore suspension for physiological and biochemical studies would be one in which the reactions observed could be clearly related to an identical phenotype of the spore itself. Although this is difficult to achieve by virtue of the growth variations during sporulation, one can, in practice, strive for two goals; (1) the removal of potential substrate and germination requirements from contaminating sporulation medium and lysed cells and (2) the removal of enzymes associated with contaminating cell debris.

Studies were carried out with seven thoroughly washed spore strains free of contaminating debris. The experiments on breaking dormancy in these spores were made by measuring germination in the presence of L-alanine and glucose. The germination measurements were made by observing the increased optical density, the uptake of methylene blue, and a loss in heat resistance which occurred when spore dormancy was broken and germination ensued. Requirements for optimal germination of these spore strains were found to be a pH range between 6.5 and 8.0, an inorganic phosphate requirement and a heat treatment at 65°C for 15 minutes. The heat shocking at 65°C for 15 minutes was not necessary for germination of fat extracted dormant spores. It was observed that the optimal concentrations of L-alanine and glucose were spared by pyruvate and lactate, in two spore strains investigated.

The common requirement of L-alanine for breaking dormancy and the occurrence of an alanine racemase enzyme in these spores suggested the possibility that the enzyme was the first stage in breaking spore dormancy. This possibility was ruled out by germinating 73 per cent

of the spores at pH 11.3 where the racemase enzyme was inactive.

The occurrence of glucose as a requirement in breaking dormancy is widespread among aerobic and anaerobic spore forming bacilli. The pH optimum, the phosphate and heat treatment requirements in connection with optimal glucose germination suggested that certain enzymatic activities were operative in breaking dormancy. Oxidation of glucose by intact spores of B. cereus var. terminalis was observed after heat treatment at 65°C for one hour. This prolonged heating of the spores was not necessary when the oxidative activity of the spore extract was measured. However, for optimal glucose oxidation by the extract, heat was required prior to spore rupture. The spore extract oxidized glucose in the presence of DPN and TPN. Other cofactor requirements were found to be ATP, coenzyme A, cocarboxylase and inorganic phosphate. Glucose-6-phosphate, fructose-6-phosphate or hexose diphosphate were not oxidized by either the intact spore or the spore extract. Pyruvate was oxidized by both the intact spore and the spore extract, and gluconate and 2-ketogluconate were oxidized by the spore extract. A 2-ketogluconokinase activity as well as oxidation of certain Krebs cycle intermediates were demonstrated in the spore extract. These were succinate, oxaloacetate, fumarate, and acetate. Both the intact spore and spore extracts liberated one mole of CO<sub>2</sub> and utilized one mole of O<sub>2</sub> during oxidation of both glucose and pyruvate.

The occurrence of a non-phosphorlytic and possibly a phosphorlytic shunt mechanism in these spores is discussed. There was no evidence of an Embden-Meyerhof system demonstrated in these studies.

Two general conclusions drawn from this study were (1) that both glucose and L-alanine served as substrates for enzyme systems whose activities were unrelated to the breaking of dormancy (2) the breaking of dormancy was carried out by glucose and L-alanine possibly through other or interrelated enzymatic pathways.

125 pages. \$1.70. Mic 56-2065

#### BIOCHEMICAL CHARACTERIZATION OF SOME CHEMICALLY INDUCED MUTANTS OF ESCHERICHIA COLI

(Publication No. 16,934)

Dorothy Deane Faris, Ph.D.  
University of Colorado, 1955

Supervisor: Professor Charles F. Poe

Manganese chloride was used to induce mutations in a streptomycin-dependent strain of Escherichia coli, strain Sd 4. A preliminary study designed to obtain mutants by means of cobalt 60 was unsuccessful. Failure in this effort was probably caused by the smallness of the sample of radioactive cobalt, the amount available being only 100 millicuries. The procedure followed to obtain chemically induced mutants was essentially that described by Demerec and Hanson in 1951.

The biochemical characters of twenty-four of these mutants were determined as fully as possible. A double screening technique was employed so that some of the

mutants obtained were non-lactose fermenters, or were slow fermenters, in addition to being streptomycin-independent. Strain Sd 4 was derived by Demerec in 1951 from a radiation-resistant strain, B/r. This radiation-resistant strain was derived by Witkin in 1946 from a normal strain designated as B. These three parental strains were included in the investigation, for reference.

The purpose of this research was to supply information concerning the mutational range of one strain of one bacterial species. Such information was considered to be of possible value with respect to the present descriptive mode of classification of bacteria. The currently accepted bacterial classification is based largely upon biochemical characters. These characters are known to be subject to mutation.

The tests applied to the mutants and to the parental strains included those used for distinguishing the genus Escherichia from the closely related genus Aerobacter, as well as those used for differentiation of the interspecific and intraspecific categories of the species Escherichia. These tests included determination of: changes in ability to attach thirty different fermentable substances; changes in various non-fermentative characters, such as production of indole and of acetyl methyl carbinol, and ability to utilize citrate as sole carbon source; changes in sensitivity to nine different bacteriophages; changes in sensitivity to thirteen different antibiotics; changes in nutritional competency.

All of the mutant strains differed in at least one respect from the parental strain Sd 4, in addition to being streptomycin-independent. Many differed in several respects. Two had as many as six additional variant characters. Sixteen of the mutants showed altered fermentative characters; four showed altered sensitivity to one or more of the bacteriophages used. All except one showed altered sensitivity to one or more of the antibiotics employed, exclusive of streptomycin or dihydrostreptomycin. None of the mutants differed from any of the parental strains with respect to the non-fermentative characters tested. No auxotrophs were found. All of the mutants were more or less streptomycin-sensitive; no resistant strains were found.

The changes produced in bacteriophage sensitivity and in antibiotic sensitivity would be of genetic significance, but not, at least at present, of classification significance. The only variations produced which would be important from the point of view of classification were those with respect to fermentative characters, and specifically the instances in which lactose was not fermented, or was slowly fermented. Any mutants having such characters could be classified as paracolons. The multiple effect of manganese chloride in producing a variety of mutant characters in the bacterium Escherichia coli, strain Sd 4, would suggest that this chemical might play some role in spontaneous mutability, and therefore in the evolution of species, as it is known to occur abundantly in nature. This multiple mutagenic effect would suggest also that caution might be exercised in the employment of such a substance in culture media.

107 pages. \$1.50. Mic 56-2066

STUDIES ON AN ANTAGONISTIC PHENOMENON  
OF A PARENT POPULATION OF ESCHERICHIA  
COLI AGAINST A CITRATE-UTILIZING  
MUTANT POPULATION

(Publication No. 16,885)

Elmer Virgil Howell, Jr., Ph.D.  
University of Utah, 1956

Chairman: Paul S. Nicholes

A parent and mutant strain of *E. coli* have been studied for any mutual antagonisms. The ability of cell populations to suppress the growth of mutant cells is of considerable significance especially since it undoubtedly affects many previous calculations of mutation rates. Moreover, differences between the parent and mutant strain would be indicated. This would suggest important implications in connection with the question of antibiotic resistance. The possibility of controlling selective factors in genetically mixed populations may have important practical applications in cancer research and in clinical and epidemiological microbiology. Other basic problems such as the nature of the mutagenic action of various radiations may be better understood when more is learned about this population effect.

The parent strain used was randomly selected from available strains. The citrate-utilizing mutant strain was also a random choice of many such mutants resulting from induction by ultraviolet light. An extensive review of the literature is presented. Findings from this review indicate that antagonisms between closely related species among the family Enterobacteriaceae are of frequent occurrence. Considerably fewer investigators have reported inhibitory effects between parent and mutant strains within a given species.

The application of several techniques for investigating antagonisms indicated that a substance was produced by the parent strain inhibitory to the mutant strain. The parent strain was also shown to produce a self-inhibiting substance. The latter was observed only with the use of partially dehydrated agar plates.

Experiments indicated that the substance antagonistic against the mutant strain was relatively thermostable. Aeration increased its production in broth cultures. Seitz filtration of broth cultures caused a reduction of the active principle in the filtrate as compared with filtration through fritted glass filters. The antibiotic was active against several *E. coli* strains tested, but showed no activity against several other species. Mutant strains resistant to the antibiotic were isolated. Aged citrate-utilizing mutant cells were found to be more sensitive to the active substance than young cells. Ultraviolet irradiation was also found to increase the sensitivity of the mutant cells. These findings suggested that the substance is similar to a group of antibiotics discovered by Gratia in 1925 and later named "colicins" by Gratia and Fredericq.

A condition of colicinogeny as discovered by Jacob, Siminovitch and Wollman was considered. Increased production of the inhibitory substance was attempted by ultraviolet irradiation. Subjection of the parent cells to this and other adverse physical conditions resulted in no increased production. The possibility of a correlation between mutation to citrate utilization and sensitivity to the antagonistic substance was considered. In a limited num-

ber of strains tested to date, no correlation has been found.

A given number of cells of the mutant strain were plated with large populations of parent cells onto citrate agar plates. The resulting number of colonies of the mutant cells decreased as the size of the parent inoculum was increased. Cells from the mutant strain but resistant to the active principle were similarly plated with large populations of the parent cells. No decrease in the resulting colonies was then noted. This suggested the decrease of the mutant colonies to be caused by the antibiotic substance.

The significance of the problem of parent-mutant antagonisms has been discussed in light of a controversy on the question of the mutagenic effect of X radiation.

150 pages. \$2.00. Mic 56-2067

FRACTIONATION OF THE STABLE ISOTOPES  
OF SULFUR BY MICROORGANISMS  
WITH PARTICULAR REFERENCE TO  
THE SULFATE-REDUCING BACTERIA

(Publication No. 16,680)

Galen Everts Jones, Ph.D.  
Rutgers University, 1956

The degree of selective utilization (fractionation) of the stable sulfur isotopes, S<sup>32</sup> and S<sup>34</sup>, during the bacterial transformations of sulfur materials was investigated. The cultures used were the sulfate-reducing bacterium, *Desulfovibrio desulfuricans*, and the sulfur-oxidizing bacterium, *Thiobacillus thiooxidans*. The results of the studies with the sulfate-reducing bacterium were considered in connection with the origin of the native sulfur deposits in the cap rock of the salt domes of Texas and Louisiana.

Fractionation has been shown to occur in nature in such a way that the lighter sulfur isotope, S<sup>32</sup>, has been concentrated in the sulfides and the heavier sulfur isotope, S<sup>34</sup>, has been concentrated in the sulfates when compared to standard meteoritic sulfur. The maximum fractionation which is theoretically possible is 7.4 percent.\*

Experiments were carried out in which the sulfate-reducing bacteria were cultivated in 500 ml glass-stoppered bottles. The MgSO<sub>4</sub>·7H<sub>2</sub>O concentration varied from 0.3 to 5.0 percent. At the lower salt concentration there was no fractionation, whereas there was fractionation of the sulfur isotopes of 1.4 to 1.5 percent at the higher concentration.

*D. desulfuricans* was grown in three to four liters of liquid substrate with continuous passage of nitrogen gas whereby the sulfide produced by reduction of sulfate could be recovered at various incubation periods. In most cases, the bacterium was cultivated in a fermentor provided with a mechanical agitator. The temperature, energy source, and sulfate concentration were varied in these experiments.

The degree of fractionation of the sulfur isotopes varied from negligible values to 2.7 percent. The rate of sulfate reduction affected the degree of fractionation. In general, there was less fractionation during periods of rapid sulfate reduction and greater fractionation when sulfate was being reduced slowly. Fractionation was favored by high concentrations of sulfate in the medium. Low tempera-

tures proved to be the most effective means of keeping the rate and growth consistently slow.

Tests were made for development of sulfate-reducing bacteria in substrates with organic matter provided as crude oil or crude oil and 0.1 percent yeast extract. The media were inoculated with materials from the region of oil wells or basins used for treatment of oil well waters. More than 200 ppm of sulfide were formed in the substrates under certain conditions suggesting slow development of sulfate-reducing bacteria on crude oil. The results support the theory that crude oil was the source of energy for sulfate reduction that led to formation of elemental sulfur in the sulfur deposits.

Sulfate-reducing bacteria were found capable of developing well in media containing at least 6 percent  $MgSO_4 \cdot 7H_2O$  or saturated with  $CaSO_4 \cdot 2H_2O$ . They were inhibited by more than 1.8 percent sodium lactate.

T. thiooxidans did not fractionate the sulfur isotopes during growth on elemental sulfur.

From the results obtained and from information on conditions in the sulfur deposits, it seems likely that sulfate-reducing bacteria were important agents in the process responsible for deposition of the large amounts of sulfur in the salt domes of the coast of the Gulf of Mexico. It is probable that they reduced sulfate to sulfide from which the elemental sulfur was formed by some non-biological reaction.

195 pages. \$2.44. Mic 56-2068

$$\text{*Percentage fractionation} = \frac{(S^{32}/S^{34} \text{ of product}) - (S^{32}/S^{34} \text{ of reactant})}{S^{32}/S^{34} \text{ of reactant}}$$

#### THE EFFECT OF PENICILLIN AND STREPTOMYCIN, SINGLY AND IN COMBINATION, ON SOME METABOLIC REACTIONS OF STREPTOCOCCUS FECALIS #9790

(Publication No. 13,765)

Vincent Alexander Lagerborg, Ph.D.  
University of Colorado, 1955

Supervisor: Associate Professor William E. Clapper

Since some of the most dramatic therapeutic results in man have been reported with the enterococci and a combination of penicillin and streptomycin, an investigation was made to determine the effect of these antibiotics on certain enzymatic reactions of Streptococcus fecalis #9790, with the hope that such an investigation might help explain their mechanism of action and synergistic effect.

A synergistic inhibitory action against the growth of the organism by penicillin and streptomycin was demonstrated by the tube dilution method. Therefore, the action of these two antibiotics, singly and in combination, upon the utilization of certain substrates by the organism was determined manometrically. The following substrates were used: 0.5M glucose, 0.1M concentrations of the sodium salt of glycerophosphoric, pyruvic, citric, alpha keto-glutaric, succinic, fumaric and malic acids, putrescine, arginine and tyrosine. The concentration of the antibiotics used, unless otherwise specified, was 3,122 units/ml. It was noted that the utilization of some substrates was of a

low order. Yeast extract (10%) was added to the reaction flasks in an attempt to increase the metabolism of the organism. The utilization of some substrates and the endogenous metabolism of the organism was increased by the addition of the yeast extract. The following substrates were not utilized, aerobically or anaerobically, by the organism: sodium succinate (anaerobically only), glycero-phosphate, citrate, fumarate or malate.

Experiments were conducted to determine if the factor or factors in yeast extract responsible for the increase in metabolism of the organism could be found or replaced by another type of treatment. These experiments were:

1. The determination, aerobically and anaerobically, of the endogenous metabolism and the utilization of substrates previously utilized by the organism, in the presence of cocarboxylase, DPN, ATP and solutions of trace elements and vitamins.
2. The use of glucose and sodium succinate as "sparkling substrates" in the aerobic utilization of sodium pyruvate by the organism.
3. The effect upon the aerobic utilization of sodium pyruvate by the organism of whole and sonic disintegrated cells of various ages.

Negative results were obtained in these experiments with the exception of the aerobic utilization of sodium pyruvate in the presence of cocarboxylase.

The following reactions were inhibited by:

- A. Streptomycin alone:
  1. The endogenous anaerobic acid production (when yeast extract was present).
  2. The anaerobic utilization of sodium pyruvate and alpha keto-glutarate (when yeast extract was present).
  3. The aerobic utilization of sodium pyruvate (both 3,122 and 1,561 units/ml), sodium succinate and alpha keto-glutarate (when yeast extract was present).
  4. Anaerobic utilization of glucose.
  5. Diamine oxidase activity (substrate, putrescine).
  6. Cocarboxylase-stimulated aerobic utilization of sodium pyruvate.

##### B. Penicillin alone:

No reactions inhibited

##### C. Penicillin and streptomycin combined:

1. The above reactions were inhibited to the same degree as by streptomycin alone with the exception of sodium pyruvate, in which case a greater inhibition of oxygen uptake by the organism was produced than by streptomycin alone. When 1,561 units/ml of each antibiotic was employed, the degree of inhibition of the combination was the same as by streptomycin alone.
2. The endogenous respiration of the organism (no inhibition by penicillin or streptomycin alone).

The following reactions, at pH ranges of 6.6-6.0, were accelerated by:

- A. Streptomycin alone:
  1. Decarboxylation of tyrosine
  2. Dihydrolation of arginine
- B. Penicillin alone:
 

No effect
- C. Penicillin and streptomycin combined:
 

Reactions were accelerated to the same degree as by streptomycin alone.

Results were not obtained indicating the mechanism of

action of penicillin and streptomycin nor what factor or factors in yeast extract were responsible for the increased endogenous metabolism and utilization of certain substrates by the organism. Speculations were made concerning the results obtained in this work.

121 pages. \$1.51. Mic 56-2069

**PROPERTIES OF VIRULENT, INCOMPLETE,  
AND VACCINE STRAINS OF NEWCASTLE  
DISEASE VIRUS IN EMBRYONATED  
EGGS AND IN TISSUE CULTURES**

(Publication No. 17,393)

Carmine Charles Mascoli, Ph.D.  
The Ohio State University, 1956

Fundamental properties of Newcastle disease virus, (NDV), such as hemagglutinin, infectivity, and cytopathogenicity, have been extensively studied by embryonated-egg techniques. Relatively little work has been done, however, on the study of these properties by tissue culture techniques, or on the comparative aspects of NDV in tissue culture and embryonated eggs. In the present work, hemagglutinin infectivity and cytopathogenicity were examined in embryonated eggs and tissue cultures of chick embryo fibroblasts. Two vaccine strains, one virulent strain and an "incomplete" form of the virulent strain, were employed in the study.

The development of the incomplete form of virulent NDV was accomplished by the fifth transfer of large inocula of the complete virus. The development of this form corresponds more closely to the process with the Lee strain of influenza which is more resistant to conversion than the PR8 strain. Fifth-passage fluids possessed an LD<sub>50</sub> of  $10^{-6.75}$  as compared with  $10^{-10.5}$  for the standard form. Hemagglutinin-infectivity ratios for these forms were respectively  $1:10^{3.75}$  and  $1:10^{7.2}$ .

Cytopathogenicity produced by virulent, incomplete, and the two vaccine strains of NDV for chick embryo fibroblasts in two tissue culture media was essentially the same, and proceeded at the same rate. Complete degeneration of the cells occurred in two to four days. Granulation and vacuolation of the cytoplasm were followed by loss of cytoplasmic extensions and concomitant nuclear pyknosis.

The growth and development of the incomplete form and the two vaccine strains were approximately the same when transferred to tissue culture. Essentially, infectivity for chick embryos and hemagglutinin production were reduced although the hemagglutinin-infectivity ratios were as expected. The viruses corresponded to "early" virus of approximately twelve hours in the embryonated egg, possessing an infectivity of  $10^{-8}$  and little hemagglutinin. The same type of virus was obtained with the virulent strain only after approximately 6 to 10 passages or after prolonged incubation of the cellular debris following cytolysis of the original cultures. None of the forms showed significant changes in these properties on further passage.

The number of available cells in tissue culture undoubtedly contributed to the predominance of this type of virus found in the original cultures of the vaccine and incomplete virus. This factor was controlled and does not

account for the original variation of the virulent form. The fact that the early type of virus was obtained with the virulent form by prolonged incubation of the cellular debris following cytolysis and by further passage suggested that cytolysis may have interrupted the time sequence of events leading to this type of virus. The most ready explanation would be a more rapid cytolytic capacity of the virulent form which has been reported by Bang. This was not observed here; in fact, cytolysis proceeded equally with all four forms.

Two explanations are possible according to the hypothesis of Burnett that various degrees of completeness exist in a virus population, some of which are characterized by a slower release from cell receptors. Virulent virus in original cultures was released more slowly than the predominant virus of the other forms. Thus, it might be maintained that the latter were better adapted to produce primarily the characteristic early tissue culture virus more rapidly. The virulent form acquired all of the same capacities only by passage. The adaptation probably involved the development of virus with the enzymic capacity for earlier release from receptors. It is also suggested that this enzymic capacity was developed during "maturation" of the original type of tissue culture virus on cellular debris during prolonged incubation.

167 pages. \$2.20. Mic 56-2070

**ANTIGENIC AND CULTURAL PROPERTIES  
OF NOCARDIA**

(Publication No. 16,922)

John Donald Schneidau, Jr., Ph.D.  
Tulane University, 1956

Chairman: Dr. Morris F. Shaffer

**1. Statement of the problem.**

The major objectives of the study are as follows:

- (a) To study the cultural characteristics of a large number of strains of Nocardia, as well as strains of Mycobacterium and Streptomyces in order to determine the value of various cultural characteristics as criteria for specific determinations.
- (b) To develop procedures for the preparation of stable suspensions of Nocardia and to investigate by means of slide agglutination tests the serologic relationships that exist within the genus Nocardia and between members of the genus Nocardia and related organisms, particularly the Mycobacteria.
- (c) To attempt to correlate cultural characteristics with antigenic relationships.

**2. Methods.**

- (a) Comparative cultural studies were carried out with fifty-one strains of Nocardia, representing twenty-two species (including twenty strains of N. asteroides), ten strains of Mycobacterium representing seven species, and four species of Streptomyces. Cultural characteristics

- studied included gross and microscopic morphology on various media, pigment and aerial mycelium production, temperature tolerance, acid-fastness, paraffin utilization, hydrolysis of starch and casein, gelatin liquefaction, catalase activity, indole production, hemolytic activity on blood agar, urease activity, and, for a limited number of Nocardia strains, fermentation of carbohydrates and nitrate reduction.
- (b) Antigenic suspensions were prepared, from cultures grown on a uniform fluid medium, for the following organisms: twenty strains of Nocardia asteroides, six strains of N. mexicana, three strains of N. madurae, two strains of N. pelletieri, one strain each of eighteen additional identified species of Nocardia, one strain each of two species of Streptomyces, ten strains representing four different saprophytic species of Mycobacterium and nine strains of M. tuberculosis, including bovine, avian and human types. Stable homogenous suspensions of the microorganisms were obtained by grinding the microbial mass with Celite in a mortar and suspending in a buffered phenolized saline diluent containing sodium taurocholate as a stabilizer.
- (c) Rabbit antisera were prepared against all strains of Nocardia used for the preparation of antigen suspensions, with the exception of four of the eighteen species of the miscellaneous group. Antiserum was not prepared against any strains of Mycobacterium. Satisfactory antibody production was obtained by an immunization procedure which combined subcutaneous injection of an oily suspension with a series of intravenous injections of a saline suspension of the antigen. Homologous microscopic slide agglutination titers obtained ranged from 1:40 to 1:640. Each antiserum was tested, in selected dilutions, against all antigens available; suitable controls were employed.
3. Results.
- (a) Characteristics that appeared to be stable and of value for specific or group identification were: a) color of the stroma under uniform culture conditions; b) temperature tolerance; c) hydrolysis of starch; d) hydrolysis of casein; e) liquefaction of gelatin; and f) urease activity. Characteristics such as paraffin utilization, catalase activity, indole production, and carbohydrate fermentation appeared to be of no value for identification inasmuch as they were either present or absent in all strains studied
- (b) irrespective of other morphologic or physiologic characteristics. Aerial mycelium production, acid-fastness, production of a diffusible pigment, nitrate reduction and hemolytic activity were variable for many of the strains studied and thus have only a limited value as taxonomic criteria.
- (c) On the basis of the cultural data it is possible to separate the Nocardia strains into two distinct groups which have been designated the "true Nocardia" and the "Streptomyces-like Nocardia." The true Nocardia may be subdivided culturally into the following subgroups: (1) N. asteroides sub-group (all strains of N. asteroides plus N. blackwellii, N. cuniculi, N. caprae, and N. sylvodolorifera); (2) N. polychromogenes sub-group (N. polychromogenes, N. minima and N. paraffine); (3) N. corallina sub-group (N. corallina, N. globularia, N. erythropolis and N. convoluta); (4) N. opaca sub-group (N. opaca, and N. rubra); and (5) N. mexicana sub-group (six strains).
- (d) The comparative agglutination study indicated that those strains which possessed cultural characteristics similar to Streptomyces were serologically distinct from other strains of Nocardia. The various strains of the Streptomyces-like Nocardia showed little cross-reactivity among themselves and also appeared to be serologically distinct from the strains of Mycobacterium studied.
- (e) Widespread cross-agglutination was the rule among the true Nocardia group, and in this group only N. mexicana strains showed any marked serologic distinctness. The N. asteroides, N. corallina, N. opaca, and N. polychromogenes groups (which were defined on a cultural basis) could not be identified as distinct groups by the serologic methods employed with the possible exception of the N. polychromogenes group which exhibited only a limited degree of cross-agglutination with the other groups. N. intracellularis, although acid-fast, showed a high degree of specificity and behaved more like a Mycobacterium than a Nocardia.
- (f) Antisera to a few strains of the true Nocardia agglutinated M. tuberculosis antigens and antisera to most Nocardia strains agglutinated M. fortuitum antigens, but otherwise there was little cross-reactivity between species of Mycobacterium and the true Nocardia.

100 pages. \$1.50. Mic 56-2071

## BIOLOGY - GENETICS

### BIOLOGY AND IMMATURE STAGES OF THE SOLITARY DIGGER WASPS BELONGING TO THE TRIBE BEMBICINI (HYMENOPTERA:SPHECIDAE)

(Publication No. 15,026)

Cheng Shan Lin, Ph.D.  
Cornell University, 1955

The objectives of this study are two: (1) to describe the life histories of the North American Bembicine wasps, and (2) to make comparative descriptions of the immature stages of these wasps.

The life histories of the following 10 species of Bembicine wasps have been observed and studied: Stictia carolina Fabr., Bembix belfragei Cress., Bembix pruinosa Fox, Bembix troglodytes Handl., Bembix spinolae Lep., Bembix primaestate J. & R., Bicyrtes quadrifasciata Say, Bicyrtes fodiens Handl., Bicyrtes ventralis Say and Microbembex monodonta Say.

The egg of Stictia carolina Fabr., Bembix pruinosa Fox, Bembix troglodytes Handl. and Microbembex monodonta Say is laid on the cell floor and glued to sand grains. These wasps practice progressive provisioning of their young. The first 3 species bring in freshly paralyzed flies day by day, while the last one brings back a large variety of insects, mostly dead ones, including small spiders.

Bembix belfragei Cress., Bembix spinolae Lep. and Bembix primaestate J. & R. These wasps hunt a fly first, then lay an egg glued to the victim's wing base near the squama. These wasps also practice progressive provisioning about 2 days later when the egg has hatched. The female wasps bring in freshly paralyzed flies day by day to feed their young. The first fly, to which the egg is attached, is not consumed by the larva; presumably it is not fresh enough for food.

Of the 3 Bicyrtes species so far studied, all practice mass provisioning, that is, the female wasps, upon completion of the nest, hunt and bring in a hemipterous nymph and lay an egg on it; then more nymphs are added in the cell during the day.

The development of these wasps is very much the same. The incubation period of the egg is 2 days, the larva feeding period is about 5 days, and the period of spinning of the cocoon is about 2 days. The pupal stage varies quite markedly. Bembix pruinosa Fox, Bembix spinolae Lep., Bembix primaestate J. & R., Bicyrtes quadrifasciata Say and Microbembex monodonta Say may transform to pupae within a one month period, then emerge to start a second life cycle, thus having 2 or more generations a year. In others, such as Stictia carolina Fabr., Bembix belfragei Cress. and Bembix troglodytes Handl., transformation takes place early next summer to complete a one year life cycle.

A comparative study of 14 mature larvae of the Bembicine wasps has been made. Besides the 10 species mentioned above, 4 other species were added; they are Bembix sayi Cress., Bembix comata Parker, Bembix cinerea

Handl. and Bembix occidentalis beutenmulleri Fox. The larval stages of all these wasps are superficially similar in appearance although they do differ in size. The larvae in general are eucephalous-apodus grub-like creatures, and are prognathous and holopneustic. The body behind the head is 13-segmented, flattened spindle-shaped, tapering gradually on both ends. In preserved specimens, the body is slightly arched. The chief generic and specific differences are found in the details of the head capsules, antennae, and mouthparts, observable for the most part only under high power.

135 pages. \$1.69. Mic 56-2072

### EVIDENCE OF CHROMOSOMAL ADAPTIVE POLYMORPHISM IN DROSOPHILA PERSIMILIS: RATES OF DEVELOPMENT AND RELATIVE SURVIVAL AMONG GENE ARRANGEMENT CARRIERS

(Publication No. 16,523)

Robert Joseph Schuellein, Ph.D.  
University of Pittsburgh, 1956

Drosophila persimilis from a high elevation of 8,000 feet in the Sierra Nevada of Yosemite National Park was studied to ascertain the rates of development and relative survival for two specific gene arrangements on the third chromosome, (WT- Whitney and KL- Klamath) in order to elucidate the problem of distribution in nature why WT arrangement is more frequent than KL, why both coexist in nature, and why WT is superior to KL in adaptive value under artificial population cage conditions.

Eight replications for each karyotype were run in petri dishes containing a special nutrient agar medium. Flies to be tested were progeny of strain crosses because it was necessary to make any given chromosomal variant heterozygous for its gene contents but homozygous for its arrangement.

Morphological characteristics for macroscopic identification of the instars of D. persimilis are described. With the use of a special tabulation grid the respective instars were examined and their developmental periods were measured.

It was found that per cent hatchability and per cent eclosion of adults were the two viability factors responsible in part for the production and maintenance of equilibrium in experimental populations. A parallel pattern exists between per cent hatchability and per cent adult eclosion for each karyotype. Moreover, per cent hatchability can be attributed to heterotic loci on the third chromosome.

A higher frequency of WT arrangement in nature and in experimental population cages is in part the result of faster developmental rates for the first, second, and third larval instars, a shorter pupal period and a shorter life cycle for flies possessing that arrangement than for flies possessing KL.

Differences between WT/KL individuals, derived by separate technique, and WT/WT and KL/KL, for developmental rates must be brought about by "luxuriance" in the residual genome of the heterokaryotype which breaks down in the double cross. This phenomenon tends to indicate a situation in which the original strains are not as homozygous as if the strains had been maintained by severe inbreeding.

The heterokaryotype individuals obtained by double-cross technique are equal to KL/KL in first instar, second

instar, and pupal periods. They are intermediate for the third instar period. Therefore, no evidence of heterosis for rate of development brought about by heterotic loci on the third chromosome can be said to exist.

Evidence of maternal effect for heterokaryotypes was apparent for per cent hatchability of eggs. A specific influence due to one particular KL female genotype upon the egg cytoplasm which brought about incompatibility with the WT arrangement genotype was noted.

98 pages. \$1.23. Mic 56-2073

## BOTANY

### ON THE EXTRACTION AND FORMATION OF NATIVE AUXINS IN PLANTS

(Publication No. 16,967)

Edwin Francis Alder, Ph.D.  
The University of Oklahoma, 1956

Supervisor: Dr. Elroy L. Rice

Attempts were made to devise a satisfactory procedure for extracting auxin from plant tissues. A standard extraction procedure employing an ether-water mixture under constant agitation was adopted. The water volume was found to limit auxin extraction. Apparently auxin was extracted by the water and then partitioned into the ether. Partitioning was improved by continuous agitation of the ether-water mixture. Auxin yield was not increased by any of the following treatments: (1) the addition of acid to the water, (2) the use of inactive non-acidic ether, (3) the addition of fresh ether, or (4) repeated rinsing with fresh ether.

Auxin yield from maize endosperm was greater during the first few hours at 22° C. than at 1° C. even though destruction of auxin was demonstrated at the higher temperature. Sodium diethyldithiocarbamate (Na-DEDT) inhibited this destruction.

Maize endosperm auxin apparently exists in three states: (1) a small ether-soluble portion readily extractable with ether, (2) a larger loosely-bound ether-soluble portion extractable only with water, and (3) an auxin complex which could be extracted with water but was soluble in ether only after drastic alkaline hydrolysis.

Non-acidic auxin was not found. The acidic auxin, both the ether-soluble and the auxin complex hydrolysate, gave chemical and biological tests identical with indoleacetic acid (IAA).

In further investigations fresh etiolated pea internodes were extracted and the formation and significance of the auxins thus obtained were studied. It was not necessary to add water or agitate fresh pea tissue to obtain maximum auxin yields with ether as an extractant; however, if water was added agitation became essential for maximum yields.

With pea internodes, as in maize, more acidic auxin was obtained at 22° C. than at 1° C. during the first three hours of extraction. After three hours the yield of auxin was greater at 1° C. owing to the inactivation of the IAA

oxidase complex at this temperature. Na-DEDT (100 p.p.m.) inhibited auxin destruction and the formation of non-acidic auxin. It also appeared to have other inhibitory effects upon extraction, thus reducing the amount of auxin which could be called "free" auxin.

Non-acidic auxin production occurred only during extraction with organic solvents at temperatures favorable for enzymatic activity. Thus, it appeared to be an extraction artifact of little significance *in vivo*.

Acidic auxin increase with Na-DEDT over a long extraction period probably resulted from decreased auxin destruction and increased acidic auxin formation. The latter event presumably occurred because the non-acidic formation system was blocked and there was subsequently a greater availability of the common substrate.

Identification of non-acidic auxin by ultraviolet fluorescence and chemical tests was unsatisfactory. Biological tests in conjunction with paper chromatography were more satisfactory, but inconclusive. Possibly the non-acidic auxin was indole acetaldehyde or indole acetonitrile or perhaps a mixture of the two.

72 pages. \$1.50. Mic 56-2074

### A REVISION OF THE GENUS ERECHTITES (COMPOSITAE); WITH INQUIRIES INTO SENEPIO, CRASSOCEPHALUM, GYNURA, AND ARRHENECHTHITES

(Publication No. 17,413)

Robert Orange Belcher, Ph.D.  
University of Michigan, 1955

This paper concerns the circumscription of *Erechtites* Raf., subtribe *Senecioninae*, *Compositae*. It originated in an investigation of the reputation of *Erechtites hieracifolia* (L.) Raf. ex DC. as a pantropical weed, most material so identified from the Orient being *Crassocephalum crepidioides* (Benth.) S. Moore.

*Erechtites* was found to consist of a confusing complex of species. It was represented in the Orient not by typical *E. hieracifolia* but by the tropical var. *cacalioides* (Fisch. ex Spreng.) Griseb., and by *E. valerianaeifolia* (Wolf) DC. In addition, there were several endemic Australasian and Indonesian species assigned to *Erechtites* but having

smaller capitula and truncated style arms. Finally, there were a few American species of Erechtites with more local distribution. To clarify the status of E. hieracifolia it was necessary to examine this entire complex, together with certain closely allied genera historically confused with it.

Rafinesque founded Erechtites on an unnamed plant described by Robin in his *Flore Louisianaise*. Lessing equated this to Senecio hieracifolius L. and Sonchus agrestis Sw., and transferred Senecio cacalioides as a second species. In the greatest expansion of the genus de Candolle added four American and thirteen Australasian species. Other authors subsequently added additional species from both regions but made no detailed analysis of the whole genus.

Erechtites is to be excluded from the indigenous Old World flora. The American material exemplified by Erechtites hieracifolia consists of five species with filiform pistillate marginal florets and style-arm apices appendaged with fused papillose hairs. The indigenous Old World material with such florets has style arms truncated, not appendaged. Sixteen species, including one from the Kermadec Islands described as new, having style arms with a terminal corona of divergent papillae are placed in erechthitoid Senecio. Three species having functionally staminate disc florets and short style arms densely papillose over the outer face are placed in Arrhenechthites Mattf. The circumscriptions of these genera are emended as necessary.

Keys are provided for the identification of the genera of Senecioninae, and of the taxa of Erechtites, erechthitoid Senecio, and Arrhenechthites. Complete description, synonymy, typification, distribution, and citation of material are given for each taxon, and the history and synonymy of each is discussed. In particular, the treatments of the Australasian taxa by Hooker and by Bentham have been revised through direct comparison of their specimens and descriptions with the types of Poiret, Richard, and de Candolle.

The typification of Cacalia L., Crassocephalum Moench, and Gynura Cass. is elucidated. The views of Moore and Sprague on the fallacy of conserving the latter over Crassocephalum are supported with new morphological and nomenclatural evidence. The cytology of the erechthitoid genera is reviewed; it supports the separation of Erechtites from Senecio. The theories of Fernald and of Croizat on the phytogeography of Erechtites are revised in accord with the separation of the American species from the others. Erechtites has its closest affinity with the African Crassocephalum, rather than having its origin in Australasia.

429 pages. \$5.50. Mic 56-2075

#### SOME FACTORS AFFECTING THE VOLATILE SULFUR CONTENT OF THE ONION, ALLIUM CEPA L.

(Publication No. 12,367)

Richard Francis Foley, Ph.D.  
Cornell University, 1955

This study deals with the relationship of the volatile sulfur content or flavor of the onion to several factors which may effect it.

The characteristic flavor of cooked onion is known to be due to allylpropyl disulfide. This compound can be determined quantitatively by steam distillation under pressure, oxidation by bromine and precipitation as barium sulfate. The effect of various factors upon the flavor of cooked onion can therefore be determined.

Greenhouse and field experiments were devised to study the effect of treatments with varying levels of sulfur and nitrogen, with the cations, calcium, magnesium and potassium, and with weed control chemicals. The variation between and within varieties was also investigated.

The effect of treatment with different levels of sulfur was significant in the greenhouse, but this effect could not be shown in the field. Nitrogen treatments had no discernable effect. Chloro IPC had no effect in one year's trial. Large differences were found in the volatile sulfur content both between and within varieties. The cation treatments caused statistically significant differences in the flavor of onions.

The level of flavor in onions could be varied by some of the treatments which were applied. However, the largest variations found were not due to treatment but to the climatic differences in the years 1952 and 1954. This effect was not the result of the variation in rainfall as it occurred in the greenhouse as well as in the field. The weather records showed only a one degree fahrenheit difference in temperature between the two years. However, there was a large difference in the number of hours of sunlight and in solar radiation expressed as gram calories per square centimeter. In 1952 there were approximately 10% more hours of sunlight and radiation than in 1954. The onion bulbs grown in 1952 showed 200% more volatile sulfur than those grown in 1954.

70 pages. \$1.00. Mic 56-2076

#### RELATIONS OF RADIAL GROWTH OF BEECH (FAGUS GRANDIFOLIA EHRL.) TO SOME ENVIRONMENTAL FACTORS IN A CENTRAL OHIO FOREST DURING 1954-55

(Publication No. 17,386)

Harold Clark Fritts, Ph.D.  
The Ohio State University, 1956

Radial growth of beech appears to show a close association with available moisture and temperatures during midsummer. To investigate this and other environmental relationships with growth, a new dendrograph was developed, and six of these instruments were mounted upon beech trees grading from a well-drained beech-maple site to a poorly drained swamp-forest site.

The soil characteristics, root distribution, soil moisture, and soil temperatures were measured during the two seasons. In addition, air temperatures and rainfall were recorded.

The dendrograph proved to be reliable, and provided accurate records of daily changes in tree radius as small as one ten-thousandth of an inch. These daily changes were related to the daily weather pattern. The seasonal growth regimes for the two years were compared and related to the differences in temperature, sunshine, rainfall,

and soil moisture. The seasonal growth regimes of the individual trees during the two seasons were also compared, and these were related to differences in crown vigor, "competition," and such site conditions as soil moisture, aeration, and root distribution.

Growth was found to be very highly correlated with both the daily weather pattern and the seasonal climatic regime. Differences in the growth regimes of the six trees could be attributed to differences in the site, crown vigor, or "competition," and the influence of these on the effect of other environmental factors. When all of these variables were accounted for, growth conformed to a highly predictable pattern.

135 pages. \$1.80. Mic 56-2077

#### A TAXONOMIC STUDY OF THE GENUS PHYSALIS IN NORTH AMERICA NORTH OF MEXICO

(Publication No. 16,985)

Urnaldy Theodore Waterfall, Ph. D.  
The University of Oklahoma, 1956

Supervisor: Dr. George J. Goodman

This genus was chosen for study due to the difficulty of referring collections to currently accepted taxa, and hoping to clarify the delimitation of taxa, and the relationships among them. The group has been found to justify Asa Gray's comment made in his Synopsis in 1875, "The North American Flora hardly contains a more difficult genus for its size than Physalis".

Much of the difficulty is due to the variability of taxa, and intergradation between them. It is also due to the fact that many early taxonomists described as species some of these extremes in variability, not then having either the intergrades themselves, or a concept of the variability that we now know may occur within a species.

One approach to the problem is that commented on by Reed C. Rollins in his Presidential Address to the American Society of Plant Taxonomists in 1951, in which he suggested the selection and study of a well-delimited species within a genus to determine the amount of variability exhibited, and the judicious application of these findings as criteria of variability in other species of the same genus. Such an approach was made, using the distinct P. lobata as a criterion of variability for such characteristics as leaf shape, size and margins, variation in degree of vestiture, and similar characteristics which have been used in the delimitation of species.

As a result of this kind of study, and the examination of many intergrades between taxa, it has been concluded that in some instances the combination of several of the earlier "species" will best show their relationships to each other. The International Rules provide the techniques for, and are flexible enough to justify, such a procedure. They provide not only for genera and species, but also for subgenera, sections, subsections, series, subspecies, varieties, subvarieties, formas, lines and clones, any, or all, of which may be used in formal nomenclature to express relationships.

P. maritima, P. Elliottii and P. lanceolata var. spathulaefolia have been united as varieties of the subspecies maritima of P. viscosa. P. mollis and its var. cinerascens and var. parvifolia have been united as varieties of an inland subspecies of P. viscosa. P. subglabrata, P. longifolia, P. texana, P. lanceolata, and P. polyphylla have all been placed with P. virginiana as varieties of a large, complex and intergrading species. P. comata, P. rotundata, and P. Fendleri have been associated with P. hederifolia. P. pendula and P. lanceifolia have been considered as varieties of P. angulata. P. floridana, P. barbadensis, P. turbinata and P. pruinosa have all been included in the concept of P. pubescens.

Two new species are proposed, one from southern Texas and one from southern Arizona.

124 pages. \$1.65. Mic 56-2078

#### CHEMISTRY

#### CHEMISTRY, GENERAL

##### THE SUBSTITUTION REACTIONS OF THE METAL SALTS OF PYRROLE

(Publication No. 16,701)

Gerritt Post Bean, Ph.D.  
The Pennsylvania State University, 1956

The hydrolysis of pyrrolmagnesium bromide with heavy water gave only N-d-pyrrole. This indicates that pyrrolmagnesium bromide is completely in the N-pyrrolmagnesium bromide form.

The reaction of pyrrolmagnesium bromide with various alkyl halides indicated that the products in every case were pyrrole, 2- and 3-alkylpyrrole, polyalkylpyrroles and an unidentified basic material. The monoalkylpyrroles were separated and identified.

The relative rates of reaction of the alkyl halides increased in the order: neopentyl methyl s-butyl isopropyl allyl t-butyl t-amyl. The product from the reaction of neopentyl bromide and pyrrolmagnesium bromide was not the t-amylypyrroles, and thus the neopentyl group must not have been present as a free carbonium ion. When the reaction was carried out using optically active s-butyl bromide, it was found that the s-butyl group had been inverted with little if any racemization during the reaction.

The reaction of pyrrolmagnesium bromide with alkyl halides, which follows the S<sub>N</sub>1 order of reactivity but with S<sub>N</sub>2 stereochemistry, has been explained by a concerted "pull-push" mechanism. Because of the low dielectric of the medium, the pyrrolmagnesium bromide ion pairs are associated into aggregates. While one magnesium ion in the aggregate is polarizing the alkyl halide, a pyrrol group from another part of the aggregate, which is in a favorable position, attacks the backside of alkyl halide, and the halide ion is lost to the polarizing ion.

Because the relative reactivity of the alkyl halides follow the same order as the ease of ionization of alkyl halides, the polarizing process must be extremely important in the mechanism. However, the fact that the neopentyl group did not rearrange and little if any racemization occurred when the halide was optically active indicates that the halide is not completely ionized before the pyrryl group attacks. Because neopentyl bromide reacted almost as rapidly as did methyl bromide indicates that the carbon-halogen bond is polarized enough so that the carbon has begun to assume a planar configuration, and the pyrryl group is not hindered in its approach to the backside of the carbon atom.

Pyrryllithium and pyrrylpotassium are completely dissociated in liquid ammonia, and therefore the nitrogen atom which carries most of the negative charge is the atom attacked in a substitution reaction. However, the low dielectric of ether prevents the dissociation of the pyrrylmagnesium bromide ion pair, and the MgBr group blocks the nitrogen atom to substitution, but the unsaturated electronic system makes the carbon atoms available for bond formation by a suitable electronic shift. The same reasoning explains the C-alkylation of pyrryllithium in ether.

The reaction of acetyl chloride or ethyl acetate with pyrrylmagnesium bromide was found to give only a single product which is assumed to be 2-acetylpyrrole. The mechanism probably first involves the coordination of the oxygen atom of the carbonyl group with the magnesium atom. In this form the carbon atom can only come within bonding distance of the 2-position of the pyrrole ring. By a suitable electronic rearrangement, a bond is established; and because no polyacetylation is observed, the product is believed to remain as the magnesium salt of the pyrrole-nine form until hydrolyzed.

The reaction of pyrrylmagnesium bromide with methylpyrroles was found to be a rapid reversible equilibrium. Therefore, in the alkylation of pyrrylmagnesium bromide an equilibrium mixture of pyrrylmagnesium bromide and alkylpyrrylmagnesium bromide is being alkylated and thus polyalkylpyrroles are produced.

#### VITA

Gerritt Post Bean was born on April 29, 1929 in Amsterdam, New York. He attended the public schools of Leominster, Massachusetts, and graduated from Leominster High School in June, 1947. He received the degree of Bachelor of Science in Chemistry in June, 1952 from Northeastern University. He entered the Graduate School of The Pennsylvania State University in September, 1952, and received the degree of Doctor of Philosophy in January, 1956. He is a member of the American Chemical Society and Phi Lambda Upsilon.

143 pages. \$1.79. Mic 56-2079

#### REACTIONS OF ALIPHATIC AMINES WITH NITROUS ACID

(Publication No. 16,703)

Lawrence George Cannell, Ph.D.  
The Pennsylvania State University, 1956

The nature of the highly reactive intermediates produced from the reaction of aliphatic amines with nitrous acid has been investigated by quantitative product analysis. Elimination and substitution reactions and molecular rearrangements were investigated in the series: iso-, sec- and t-butylamines at 38°. A "free" carbonium ion mechanism is consistent with the reaction products which have been identified by infrared analysis. Isobutylamine and nitrous acid give iso-, sec-, and t-butyl alcohols and 1-butene, cis and trans-2-butene and isobutylene but no n-butyl alcohol. t-Butylamine gives only t-butyl alcohol and isobutylene (no rearranged products). sec-Butylamine and nitrous acid produce sec-butyl alcohol, 1-butene, and cis and trans-2-butene. Quantitatively, it was found that a "free" carbonium ion mechanism does not account for the ratio of elimination to substitution products.

Thiocyanate ion was selected for addition to the experiments. In addition to the alcohols and olefins listed above, this reaction gave thiocyanates and isothiocyanates as initial reaction products. Consistent with a carbonium ion mechanism, isobutylamine-nitrous acid gives iso-, sec-, and t-butyl thiocyanates and isothiocyanates; t-butylamine gives t-butyl thiocyanate and isothiocyanate; and sec-butylamine gives sec-butyl thiocyanate and isothiocyanate. Competition rate factors  $K_{RN}/K_{ROH}$  (where RN is the nucleophilic substitution product and ROH is the alcohol) were calculated from the ratios of products:

$(RSCN)/(ROH)$ ,  $(RNCS)/(ROH)$  and  $(RSCN)/(RNCS)$ .

A "free" carbonium ion mechanism (for which iso-, sec-, and t-butyl cations have same selectivity) gives correct predictions in part. None of the competition factors are of large magnitude (most values are between 1.3 and 6). The largest value was that for  $k_{RSCN}/k_{ROH}$  for isobutylamine for the isobutyl products and was 25.6. In comparison with direct displacement reactions these are very small factors  $k_{RSCN}/k_{ROH}$  and illustrate that the precursors of the products are of high reactivity.

The  $(RSCN)/(RNCS)$  ratio is 2.5 for the solvolysis of t-butyl chloride at 38°C. The same ratio for the reaction of t-butylamine or isobutylamine with nitrous acid and thiocyanate ion is 1.86. These nearly constant values of  $(RSCN)/(RNCS)$  for the three quite different reactants provide strong evidence in support of a common intermediate, a plausible structure for which is the t-butyl cation.

The formation of isobutyl thiocyanate is favored over the formation of t-butyl thiocyanate by a factor of 3.5 in the isobutylamine reaction. This factor is substantial and is in contradiction to the predictions of a "free" carbonium ion mechanism. The data is consistent with the interpretation that there are two competing reactions,  $S_N1$  and  $S_N2$ , occurring by which sec- and iso-butyl compounds are formed. The  $S_N2$  favors the formation of a thiocyanate, whereas the  $S_N1$  gives a  $(RSCN)/(RNCS)$  ratio which is characteristic of the reaction intermediate. With methylamine the  $S_N2$  process apparently predominates since the dominate product is  $CH_3SCN$ .

When the isobutylamine-nitrous acid reaction was carried out in 54%  $D_2O$ , it was found that the t-butyl alcohol

produced by the reaction contained no detectable amount (less than 2%) of deuterium bonded to carbon. The work clearly is in line with an intramolecular hydrogen migration and rules out any mechanism which requires exchange of a hydrogen with the solvent. The work of Taft and co-workers has shown that in the hydration of isobutylene in aqueous acid an intermediate is formed which can exchange a proton with the solvent. The most plausible structure for the intermediate in olefin hydration is a  $\pi$ -complex. The present work therefore shows for the first time that the  $\pi$ -complex of olefin hydration and the hypothetical bridged ions present from molecular rearrangements are not identical.

It was found that the structure of the compound (m.p. 137°) obtained by the action of trityl halides with thiocyanate ion had been incorrectly assigned the structure,  $(C_6H_5)_3CSCN$ . Reduction with lithium aluminum hydride and infrared analysis show that this compound is instead the isothiocyanate,  $(C_6H_5)_3CNCS$ . This reassignment of structure then permits a generalization to be made regarding the structural features which promote the isomerization of RSCN to RNCS. It is suggested that the most important feature is the ability of the group R to assume and stabilize a positive charge.

#### VITA

Lawrence George Cannell was born in Smithfield, Utah on June 17, 1927. After attending public schools in Cache County, Utah, he attended the Utah State Agricultural College at Logan, Utah during the years 1945-49 and 1951-52. Majoring in chemistry at this institution, he received both B.S. and M.S. degrees. The years from 1952-55 were spent at The Pennsylvania State University at University Park, Pennsylvania where work was completed in the late summer of 1955 for a Ph.D. degree in chemistry. He is a member of Phi Kappa Phi.

173 pages. \$2.16. Mic 56-2080

#### A THERMODYNAMIC STUDY OF THE ETHYLENEDIAMINE AND ACETYLACETONATE COMPLEXES OF SOME SECOND TRANSITION SERIES METALS

(Publication No. 16,705)

Henry Andrew Droll, Ph.D.  
The Pennsylvania State University, 1956

Because of the lack of complete thermodynamic data on them, the equilibria in the silver(I)-ethylenediamine, silver(I)-acetylacetone, and palladium(II)-acetylacetone systems were studied. An evaluation of the successive thermodynamic equilibrium constants for the formation of all four currently known palladium(II) chloride species was made from spectrophotometric data. These constants were subsequently employed in the calculation of the successive formation constants for the acetylacetones of palladium. The cadmium(II)-ethylenediamine system was also investigated. The results of this investigation were compared with those obtained from different experimental methods reported in the literature. The silver(I)- and cadmium(II)-acetylacetone systems were studied with a Beckman model GS pH meter which made possible the cal-

culation of log K values to the third decimal place.

For the determination of the formation constants, the pH titration technique in solutions of low ionic strength was undertaken in the case of the cadmium(II)- and silver(I)-ethylenediamine and the cadmium(II)- and silver(I)-acetylacetone equilibria. Additional information about the silver(I)-ethylenediamine system was obtained from potentiometric titrations with the silver electrode. The log K values for the palladium(II)acetylacetone complexes were determined from pH measurements on dilute  $PdCl_2$  solutions of variable KCl and acetylacetone concentrations. The numerical values of  $\log K_1$  and  $\log K_2$  for the palladium acetylacetones are nearly linear functions of total chloride concentration in solutions between 0.1 and 0.02-M in chloride. From spectrophotometric measurements on  $Pd(ClO_4)_2$  solutions of variable NaCl concentration, the step-wise chlorocomplexity constants of palladium were determined. The concentration of  $HClO_4$  in these solutions and the ionic strength maintained by  $NaClO_4$  were kept constant. Equilibrium constants were also determined for the formation of the species,  $PdCl_{n+1}^{1-n}$ , from  $PdCl_n^{2-n}$  and  $Cl^-$  ( $n > 4$ ) from spectrophotometric measurements on HCl solutions of  $Pd(ClO_4)_2$  in which the ratio  $Cl/Pd$  exceeded 1500.

The method of calculation of the formation constants developed by Block of this institution was applied to the cadmium(II)-ethylenediamine equilibria and to all the acetylacetone-containing systems. The method of calculation in the instance of the palladium(II)-acetylacetone system was modified by the inclusion of the term  $\frac{1}{2}\Sigma [Cl^-]^n Q_n Cl$  in Block's equations and by a consideration of the species  $Pd(acac)_m Cl_{n-m}^2$  which were undoubtedly present in the solutions. Formation constants for the ethylenediamine complexes of silver were computed with the aid of the Nernst equation. Empirical equations based on Beer's law were derived for the evaluation of the chloro-complexity constants of palladium.

A comparison of the results obtained in this investigation of the cadmium(II)-ethylenediamine equilibria with those reported in the literature reveals that agreement is achieved between the  $\Delta H$  value calculated from the more accurate calorimetric measurements and the  $\Delta H$  value estimated from pH measurements in solutions of low ionic strength. Somewhat higher results are obtained from pH measurements in solutions of high ionic strength. The species,  $Cd(en)^2+$ , is thermodynamically more stable than  $Cd(acac)^+$ . The larger positive entropy change which attends the reaction of the cadmium ion with the acetylacetone ion is probably associated with the change in charge of the species. The chelate effect is not exhibited by the reaction between silver(I) and ethylenediamine. In the reaction  $Ag^+ + 2en \rightleftharpoons Ag(en)_2$ , ethylenediamine functions as a unidentate ligand. A comparison of the relationship between the thermodynamic stability of palladium acetylacetone and the second ionization potential and electronegativity of palladium with the corresponding relationships exhibited by the divalent metals in the first transition series and their acetylacetones suggests the existence of another separate stability series which includes only the metals in the second transition series.

#### VITA

Henry Andrew Droll was born in Brooklyn, New York on September 2, 1926. He received his primary and sec-

ondary education in Brooklyn, New York. From October 1944 to July 1946 he was in the naval service as a medical corpsman. Before he came to Penn State in September 1953 he had obtained a B.S. and an M.S. degree from the George Washington University in Washington, D. C.

179 pages. \$2.24. Mic 56-2081

#### STUDIES IN THE CHEMISTRY OF GOLD

(Publication No. 16,724)

Luke Ralph Ocone, Ph.D.

The Pennsylvania State University, 1956

The existence of chlorobromoaurate species in aqueous solutions containing both  $\text{KAuBr}_4$  and  $\text{KAuCl}_4$  has been investigated spectrophotometrically by the method of continuous variations. The solutions were acidified to a pH of 1.9 or 2.0 to repress hydrolysis and make the solutions obey Beer's Law. The ion,  $[\text{AuCl}_2\text{Br}_2]^-$  is the only chlorobromoaurate species stable in the system employed. An attempt has been made to explain the stability of this ion by consideration of steric effects and the non-equivalence of bonds. Investigations of halocyanaurate systems and haloiodoaurate systems by similar procedures were unsuccessful because  $[\text{Au}(\text{CN})_4]^-$  did not react with halide ions in solutions and because the chloroaurate and bromoaurate solutions gave a precipitate of  $\text{AuI}$  with iodide solutions.

The reaction of auric chloride and pyridine was investigated to search for evidence of the trans effect. When anhydrous pyridine is used, this reaction gives a red-orange compound,  $[\text{Au}(\text{py})_2\text{Cl}_2]\text{Cl}$ , while aqueous pyridine solutions give a yellow compound,  $[\text{Au}(\text{py})_2\text{Cl}_2]\text{Cl}\cdot\text{H}_2\text{O}$ . An x-ray examination of these substances was undertaken to determine the symmetry of the complex ion in each compound.

The red-orange crystals were found to have a triclinic unit cell with  $a = 7.78 \text{ \AA}$ ,  $b = 8.14 \text{ \AA}$ ,  $c = 11.0 \text{ \AA}$ ,  $\alpha = 109^{\circ}05'$ ,  $\beta = 144^{\circ}12'$ , and  $\gamma = 123^{\circ}23'$ . The crystals were not piezoelectric making the centrosymmetric triclinic space group,  $C_i - \bar{P}\bar{I}$ , the more probable one. There are two molecules per unit cell. The X-ray photographs of these crystals showed spiral dislocation and a great deal of random disorder. Because of this disorder, the unit cell constants given above are only approximate. The proposed X-ray investigation of these crystals could not be completed because no single crystal suitable for intensity measurements could be obtained.

During attempts to recrystallize the red-orange compound, a small number of red-orange orthorhombic crystals were produced. These crystals were examined by the Weissenberg single crystal technique. The cell constants are:  $a = 13.5 \text{ \AA}$ ,  $b = 7.7 \text{ \AA}$ , and  $c = 6.4 \text{ \AA}$ . Attempts to produce more of these crystals in order to determine the density and chemical composition were unsuccessful.

Crystals of the yellow  $[\text{Au}(\text{py})_2\text{Cl}_2]\text{Cl}\cdot\text{H}_2\text{O}$  were examined by the Weissenberg single-crystal technique using  $\text{Cu-K}\alpha$  radiation. Because it gave an almost orthogonal cell, the reflections were indexed according to a base-centered monoclinic cell with  $a = 14.66 \text{ \AA}$ ,  $b = 12.64 \text{ \AA}$ ,  $c = 7.47 \text{ \AA}$ , and  $\beta = 91^{\circ}$ . The density is  $2.32 \text{ g/cm}^3$  and

there are four molecules per unit cell. The space group is either  $C_2^2 - B2_1$  or  $C_{2h}^2 - B2_{1/m}$ . The  $(h0l)$  reflections were recorded by the multiple film technique and estimated visually with a standard intensity scale. The intensities were corrected by the Lorentz-polarization factor and by an absorption factor. A projection of the Patterson Function along the  $b$ -axis gave the position of gold and an electron-density projection along the  $b$ -axis was made by applying the signs of the gold contribution to the absolute values of the observed structure factors. It was not possible to fit either the cis or trans molecule to the space group  $B2_{1/m}$ . An electron-density projection made by subtracting the contribution of gold suggested that the gold ion had a trans configuration and that the space group was  $B2_1$ . The atoms were placed at conventional distances and the coordinates were used to calculate structure factors. This procedure gave an R-factor of 0.182. A shift of coordinates, made with the aid of an  $F_o - F_c$  synthesis, improved the R-factor to 0.145. The signs of the observed reflections were completely determined by the contribution of the gold.

The complex ion was thus shown to have a trans configuration in the yellow substance which indicates either that the trans effect is not operative in this reaction or that the groups about Au(III) are rather labile.

#### VITA

Luke Ralph Ocone was born March 10, 1925 in Bridgeport, Connecticut. He received his primary and secondary school education in the public schools of New York City. From July 1943 to April 1946 he served in the United States Navy. In 1947 he was admitted to the Polytechnic Institute of Brooklyn and received the degree Bachelor of Science in Chemistry from this institution in June 1951. In the fall of 1951 he was admitted to the Graduate School of The Pennsylvania State University.

134 pages. \$1.68. Mic 56-2082

#### THE ELECTRIC DIPOLE MOMENTS OF THE METHYLFLUOROBORANES

(Publication No. 16,731)

Roy Katsumi Uenishi, Ph.D.  
The Pennsylvania State University, 1956

The observed shortening of the B-F bond in the methylfluoroboranes as well as in trifluoroborane has been interpreted as an indication of back-coordination. If the charge distributions within the gaseous methylfluoroborane molecules could be known, a better understanding of the nature of the bonding would be possible. It was therefore the purpose of the present investigation to estimate such a charge distribution by the determination of the electric dipole moments of the compounds.

Methyldifluoroborane was prepared by the reaction of trifluoroborane with 2,4,6-trimethylboroxine; dimethylfluoroborane was prepared by the reaction of dimethylhydroxyborane and trifluoroborane.

The heterodyne beat frequency method was used to determine the dielectric constants from which the electric moments were evaluated. The beat frequency method was

used because of the reported success of other investigators in attaining high precision which is necessary in gas measurements. The success of attaining the high precision was found to depend principally on maintaining the necessary oscillator stability. The problems of maintaining the necessary oscillator stability and the solution to these problems are discussed in detail.

The gas condenser was constructed of stainless steel and designed as two coaxial cylinders insulated by two fused quartz disks at opposite ends. The capacitance of the test condenser was found to be approximately 300 mmf. from the instrumental constant. Nitrogen and carbon dioxide were used as calibrating gases for the evaluation of the instrumental constant; ammonia was used to check the reliability of the calibration. The performance of the test cell was found to be entirely satisfactory for dielectric constant measurements made from  $310.2^{\circ}\text{K}$  to  $371.2^{\circ}\text{K}$  and from 750 mm. to 50 mm. of mercury pressure.

The best straight line of the form  $P \text{ cc./mol} = A + B/T$  was calculated by the method of least squares. The constant B is the orientation polarization and the constant A is the distortion polarization. The dipole moment was found from B, i.e.,

$$\mu = 0.0128 \sqrt{B}$$

The Debye constants for the polar gases were found to be as follows:

	<u>B cc.deg./mol</u>	<u>A cc./mol</u>	<u><math>\mu</math> (D)</u>
NH <sub>3</sub>	$12,657 \pm 153$	$5.53 \pm 0.30$	1.44
BCH <sub>3</sub> F <sub>2</sub>	$15,960 \pm 108$	$13.06 \pm 0.13$	$1.62 \pm 0.05$
B(CH <sub>3</sub> ) <sub>2</sub> F	$10,707 \pm 2$	$15.24 \pm 0.15$	$1.32 \pm 0.04$

The electric moments were found to be in good agreement with the theoretical moments which were calculated using Sanderson's electronegativities to evaluate the charge distribution within the molecules. The results are listed below together with the theoretical bond moments.

	<u><math>\mu</math> (D)</u>	<u><math>\mu_{BF}</math></u>	<u><math>\mu_{BC}</math></u>	<u><math>\mu_{CH}</math></u>
BCH <sub>3</sub> F <sub>2</sub>	1.44	2.53	1.31	0.209
B(CH <sub>3</sub> ) <sub>2</sub> F	1.31	2.41	1.19	0.183

Since the results of the investigation showed that the resultant moment of the two methylfluoroboranes are different, the moments of the corresponding bonds were assumed to be different in the two cases. This difference in observed moments together with the observed shortening of the B-F bonds were interpreted satisfactorily as contributions of back-coordination in the B-F bonds.

The inconclusiveness of the results in themselves to establish the importance of the contribution of back-coordination suggested a need for additional electric moment measurements on other related compounds. The higher alkylfluoroboranes, in particular R<sub>n</sub>C-, might offer information about the inductive effect and/or its relation to back-coordination. Methylchloroboranes and methylbromoboranes also might offer additional information concerning the importance of the size and electronegativity of the halogen atom.

#### VITA

Roy Katsumi Uenishi was born April 16, 1928 in Marquette, North Dakota. His elementary education was in

Seattle, Washington. From March 1942 to January 1945 his family lived in the Minnidoka War Relocation Camp, Hunt, Idaho and he attended high school there. From January 1945 to June 1947 he attended the Utica (N.Y.) Free Academy.

On September 1945 he enrolled at Utica College of Syracuse University and three years later he continued as a graduate student at Syracuse University. In January 1952 he transferred to The Pennsylvania State University to continue studies and in January 1956 he expects to receive a Ph.D. degree in Chemistry. He is a member of Phi Lambda Upsilon and Sigma Xi.

73 pages. \$1.00. Mic 56-2083

#### CHEMISTRY, BIOLOGICAL

##### THE ENZYMIC OXIDATION OF SARCOSINE-N-METHYL-D<sub>3</sub>

(Publication No. 16,927)

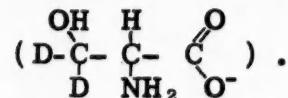
Robert H. Abeles, Ph.D.  
University of Colorado, 1955

Supervisor: Professor Cosmo G. Mackenzie

Sarcosine, which was virtually completely deuterated in the N-methyl group, was subjected to enzymatic oxidation by rat liver mitochondria. In this system, the N-methyl group is oxidatively converted to a "1-C" moiety which may irreversibly give rise to formaldehyde, or may condense with glycine to form serine. Sensitive analytical procedures are available for the quantitative determination of the reaction products. It was therefore possible to follow the rates of reaction not only from oxygen uptakes but also from the rate of product formation.

It was found that the non-deuterated sarcosine was oxidized by the mitochondrial preparation approximately 1.5 times as fast as the deuterated substrate. However, when a mixture of deutero and protium sarcosine was subjected to enzymatic oxidation the protium substrate was oxidized about four times as fast as the deuterated substrate. Thus, a more pronounced difference in the rate of oxidation was observed when the two substances were acted upon simultaneously than when they were acted upon separately. Furthermore, methoxyacetate, a competitive inhibitor for the oxidation of sarcosine, shows a stronger inhibitory effect towards the deuterated than towards the non-deuterated substrate. These results indicate that substitution of deuterium in the substrate not only affects the rate of oxidation of the enzyme substrate complex, but also the formation of this complex, i.e., enzyme substrate "affinity."

The formaldehyde and serine formed from the enzymatic oxidation of sarcosine-N-Me-d<sub>3</sub> were isolated and the deuterium content determined. It was found that at least 80% of the serine molecules resulting from the metabolism of the deuterated sarcosine contained two deuterium atoms bonded to the carbon in the  $\beta$ -position



It was concluded that formate is not an obligatory intermediate in the biosynthesis of serine from the sarcosine methyl group. Furthermore, the data show that the major pathway in the conversion of the methyl group of deutero sarcosine to the  $\beta$ -C of serine involves a formaldehyde-like intermediate. 93 pages. \$1.50. Mic 56-2084

#### KIDNEY ALKALINE PHOSPHATASE

(Publication No. 16,920)

Kazko Arai, Ph.D.  
Tulane University, 1956

Chairman: Dr. Otto Schales

Kidney alkaline phosphatase is an enzyme found in mammalian kidneys. The designation "alkaline phosphatase" is made to indicate that the optimal condition for activity of this enzyme in its hydrolysis of phosphate esters *in vitro* is on the alkaline side of neutrality, in contrast to "acid phosphatase" which has its optimum in the acidic range.

Neither the chemical properties nor the biological functions of kidney alkaline phosphatase are well-known, because up to this time it has not been possible to prepare conveniently material in sufficient quantity nor of suitable purity for such studies. The investigation of the properties of an enzyme requires a pure and homogenous material within well-defined limits. However, the purification of kidney alkaline phosphatase is attended by numerous difficulties, since the properties of the non-phosphatase proteins with which it is associated are similar to the properties of the enzyme itself.

The purposes of this study were two-fold; namely, to describe a reproducible method for the preparation of a highly purified alkaline phosphatase from kidneys in reasonable yield, to study the properties of the purified enzyme with respect to activators and inhibitors, and to investigate the possible existence of a coenzyme, a specific activator.

During this study, a simple, direct procedure was outlined for the preparation of one of the most active kidney phosphatase fractions reported so far in the literature. The procedure was reproducible from the standpoints of purity of preparation and yield, and it had the advantage of economy of time required for obtaining the purified material.

The steps involved in the purification were (1) the preparation of a crude enzyme powder of uniform composition from swine kidneys, (2) tryptic digestion of a filtered aqueous suspension of the crude powder and removal of the trypsin by adsorption on kaolin, (3) precipitation of the digest with ethyl alcohol at a concentration of 45 per cent alcohol, (4) aqueous extraction of the precipitate from the preceding step, (5) exposure of the aqueous extract to acidic conditions (pH 4.65) at 0° C and adsorption with Norit A, and (6) fractionation of the product from step (5) with ethyl alcohol at 0° C.

The purest fractions obtained between 0 to 30 per cent alcohol concentration had a specific activity of 9,000 to 11,500 (King phenol units per milligram of protein nitrogen) in a yield of 1 to 3 per cent on the basis of fresh kid-

ney, and represented a product 7,000- to 9,000-fold purer than the original material. The purest fractions obtained between 55 to 64 per cent ethyl alcohol had a specific activity of 5,000 to 6,300 in a yield of 4 to 6 per cent on the basis of fresh kidney, and represented a product 3,900- to 4,900-fold purer than the original product.

A fraction collected between 0 to 20 per cent alcohol concentration, specific activity 9,400, was electrophoretically 87 per cent one component. All fractions contained carbohydrate and inorganic phosphate. All fractions required magnesium for activity, they were inhibitive by Versene, and inhibition by Versene could be reversed partially by magnesium. All fractions were activated by incubation in alkaline buffer, by incubation in alkaline buffer in the presence of 0.01 M DL- $\alpha$ -alanine, and by incubation in alkaline buffer in the presence of 0.1 M glycine. A fraction precipitated from 56 per cent alcohol was uninhibited by 0.1 M iodoacetic acid. The Michaelis-Menten constants for two fractions of enzyme using phenyl disodium phosphate as substrate were 0.0036 and 0.0040 M. The enzyme showed little substrate specificity, liberating orthophosphoric acid from hexose-1,6-diphosphate, 1,2-propanediol-1-phosphate, 3-phosphoglyceric acid, di-sodium  $\beta$ -glycerophosphate, and adenosine-5'-monophosphate.

The non-specific nature of the reactivation of kidney alkaline phosphatase after its inactivation by prolonged dialyses at pH 5.7, 7.0 and 8.9, and by electrophoresis-convection at pH 7.2 for 41 hours, is presented as evidence that no cophosphatase exists.

107 pages. \$1.50. Mic 56-2085

#### MODIFICATION IN DESOXYRIBONUCLEIC ACID (DNA) IN RAT LIVER RESULTING FROM ALLOXAN ADMINISTRATION AND DIETARY RESTRICTION

(Publication No. 17,102)

Eugene A. Conrad, Ph.D.  
Vanderbilt University, 1956

Supervisor: Professor Allan D. Bass

It has been reported by Diermeier et al. (Proc. Soc. Exp. Biol. and Med. 77: 769, 1951, and J. Pharmacol. and Exper. Therap. 107: 478, 1953) that alloxan administration to young adult male rats, previously fasted for two days, results in an increase in the DNA of liver nuclei. In the present study, the effect of such fasting and postalloxan anorexia on rat liver DNA was investigated.

Male Sherman albino rats weighing 170-225 grams (two to three months of age) were used. DNA was extracted from liver, kidney, and spleen homogenates and estimated colorimetrically (Schneider, J. Biol. Chem. 161: 293, 1945). Nuclei from aliquot samples of the whole homogenate were enumerated in a Petroff-Hausser bacteria counting chamber. A microspectrophotometric examination of Feulgen stained liver section nuclei was performed using the method of Swift (Physiol. Zool. 23: 169, 1950).

Experiment I. The animals were fasted for two days and liver samples examined chemically and microspectrophotometrically. There was an increase in the

average DNAP content per liver nucleus from  $8.88 \times 10^{-10}$  mg.  $\pm 0.37$  to  $10.8 \times 10^{-10}$  mg.  $\pm 0.55$  ( $P .02 > .01$ ); the number of nuclei per whole liver decreased from  $28.2 \times 10^8 \pm 1.0$  to  $19.4 \times 10^8 \pm 1.4$  ( $P = .01$ ); the total liver content of DNAP was not altered significantly. The microspectrophotometric examination of individual parenchymal liver nuclei showed a decreased percentage of diploids and an increased percentage of tetraploids and octoploids; the mean nuclear volume and DNA content of the various ploidy classes were not significantly altered.

**Experiment II.** Alloxan monohydrate (198 mg./kg.) was administered to forty-eight-hour fasted rats. All animals were fed ad libitum after injection and sacrificed four days later. Following a two-day fast, an average loss of body weight of 18.5 (15.4-19.3) per cent was noted; this weight was rapidly regained if the animals were permitted to eat ad libitum during the subsequent four days. Alloxan-treated rats, although fed ad libitum, failed to regain the body mass lost during prealloxan fasting. Alloxan induced an elevation in blood sugar from 100 mgs. % $\pm 3.0$  to 696 mgs. % $\pm 41$  ( $P < .01$ ). No significant change was noted in the liver/body weight ratio, number of nuclei per liver, and the DNAP content per liver; the average DNAP content per liver nucleus increased from  $8.19 \times 10^{-10}$  mg.  $\pm .31$  to  $9.80 \times 10^{-10}$  mg.  $\pm .35$  ( $P = .01$ ) and the RNAP per whole tissue decreased from 7.19 mg.  $\pm .33$  to 6.02  $\pm .40$  ( $P = .05$ ); the percentage of diploid nuclei decreased from  $32.5 \pm .5$  to  $24 \pm 1.0$  ( $P < .01$ ). In the kidney, an increased kidney/body weight ratio, number of nuclei, and RNAP per tissue was noted; the average DNAP content per kidney nucleus was not significantly changed. Alterations in the spleen were essentially negative except for the decrease in the number of nuclei from  $20.5 \times 10^8 \pm 3.9$  to  $12.1 \pm 1.7$  ( $P = .05 > .04$ ).

**Experiment III.** Biopsy samples were obtained nine days prior to alloxan administration and were evaluated microspectrophotometrically for DNA content. A comparison between the biopsy tissue and the corresponding liver sample at the time of sacrifice showed no appreciable difference in the average DNA content of each ploidy class.

**Experiment IV.** Pair-fed control and alloxan-treated rats were studied in order to evaluate the observations noted in Experiment II. Significant differences between these groups were not observed in the following: final liver and body weights, the DNAP content and number of nuclei per liver, the average amount of DNAP per nucleus, and ploidy distributions.

In summary, the above data suggest that the elevated liver DNA observed following alloxan is not due to the drug per se but is the result of prealloxan fasting and the self-imposed limitation of diet.

96 pages. \$1.50. Mic 56-2086

#### ENZYMES OF THE TRICARBOXYLIC ACID CYCLE IN TOBACCO SEEDLINGS

(Publication No. 16,712)

Eugene Glock, Ph.D.  
The Pennsylvania State University, 1956

#### Introduction

The presence of the enzymes required for the opera-

tion of the tricarboxylic acid cycle in the tobacco plant has not yet been demonstrated. The operation of this cycle in the tobacco plant has been largely inferred from the evidence obtained from other plant species. The natural occurrence of many organic acids and the interconversions of these acids in excised leaves supports the assumption that the citric acid cycle must function.

The primary purpose of this investigation was to establish the presence of the enzymes required for the function of the tricarboxylic acid cycle in the tobacco plant. Young seedlings were used for these studies because of their relatively high respiratory activity.

#### Experimental

Lyophilized, white to cream colored, stable, enzyme powders were prepared from etiolated 7-day-old tobacco seedlings (*Nicotiana tabacum* Swarr-Hibshman strain) by cold acetone precipitation of the proteins from buffered cellfree extracts. Aerobic reduction of diphosphopyridine nucleotide (DPN) and triphosphopyridine nucleotide (TPN) in enzyme systems from this preparation were followed by measurement of the optical densities at 340 m $\mu$  in a Beckman model DU spectrophotometer. The enzyme preparation showed negligible endogenous substrate and coenzyme activity. Enzyme activities were also demonstrated anaerobically by the Thunberg technique using 2,6-dichlorophenolindophenol (DIP) or p,p'-diphenylene bis 2-(3,5-diphenyltetrazolium chloride) (DBDTC) as electron acceptors.

Direct evidence for the action of the enzyme systems were obtained by identification of the main products formed from the enzymatic transformation of substrate. The ketoacids were identified by small-scale paper chromatography and by paper electrophoresis of the 2,4-dinitrophenylhydrazones. Oxalacetic acid was also determined as the 4-nitroso-5-pyrazolone-3-carboxylate. Acetaldehyde was estimated by the colorimetric reaction with p-hydroxydiphenyl. Fumaric, malic, and succinic acids were detected in enzyme systems by radioactive tracer techniques.

Malic, glutamic, and alcohol dehydrogenases were demonstrated by the reduction of DPN after additions of 1-malate and 1-glutamate or ethanol to the enzyme systems. The products of these reactions were identified respectively as oxalacetate,  $\alpha$ -ketoglutarate, and acetaldehyde.

Aconitase, isocitric dehydrogenase, and the "malic" enzyme were indicated by TPN reduction in similar enzyme systems containing added isocitrate, citrate, or 1-malate. The product of the reaction starting with citrate and isocitrate was  $\alpha$ -ketoglutarate, and pyruvate was formed from malate.

The acetone-precipitated enzyme powders did not contain fumarase or succinic and  $\alpha$ -ketoglutaric dehydrogenases. However, fumarase along with malic dehydrogenase was demonstrated in tissue homogenates freed from endogenous substrates and coenzymes with phosphate-treated norite. Oxalacetate was the final product starting with an enzyme system containing fumarate and DPN.

Succinic dehydrogenase and fumarase could be demonstrated in cell-free seedling extracts prepared with a hand-operated glass homogenizer. The succinic dehydrogenase activity of these preparations did not appear to be stabilized by the addition of serum albumin or sucrose. By employing C<sup>14</sup>-carboxyl-labeled succinate as a sub-

strate in micro-reaction systems, fumarate and malate were isolated as products of succinic dehydrogenase and fumarase respectively.  $C^{14}O_2$  was detected as one of the products with TPN as the coenzyme.

The  $\alpha$ -ketoglutaric dehydrogenase of tobacco seedlings appeared to function with TPN, but not with DPN. That TPN reduction was coupled to  $\alpha$ -ketoglutarate oxidation could not be clearly demonstrated because of the high endogenous activity of enzyme extracts and the apparent lability of this dehydrogenase.

Alpha-ketoglutarate, glyoxylate, and pyruvate have been identified as endogenous acids present in young tobacco seedlings. Oxalacetate could not be found.

#### Conclusions

The following enzymes have been demonstrated in preparations from tobacco seedlings: isocitric, succinic, malic, alcohol, glycolic, and glutamic dehydrogenases; fumarase, aconitase, lactic oxidase, and the malic enzyme. Only presumptive evidence has been obtained for  $\alpha$ -ketoglutaric dehydrogenase.

From the experimental evidence presented in this thesis and the supporting information secured from previously reported work, it is reasonable to assume that the tricarboxylic acid cycle of Krebs operates in young tobacco seedlings.

#### VITA

Eugene Glock was born in New York City on June 6, 1927. In 1945 he graduated from Midwood High School, Brooklyn, New York. He majored in chemistry at North Carolina State College and received his B.S. degree in 1949. He received his M.S. degree in Agricultural and Biological Chemistry at The Pennsylvania State University in January 1952. He continued his post-graduate study in biochemistry and was granted the Ph.D. degree in January 1956. He has held appointments as a teaching and research assistant during his graduate studies. He is a member of Sigma Xi, Phi Lambda Upsilon, Phi Epsilon Phi, Gamma Sigma Epsilon, Sigma Pi Alpha, the American Chemical Society, and the American Society of Plant Physiologists.

106 pages. \$1.33. Mic 56-2087

#### THE METABOLISM OF ANDROSTANEDIONE AND OTHER ANDROGENS BY GUINEA PIG TISSUE HOMOGENATES AND GUINEA PIG LIVER HOMOGENATE FRACTIONS

(Publication No. 16,976)

Donald Ivan Hamm, Ph.D.  
The University of Oklahoma, 1956

Co-chairmen: Professor Charles D. Kochakian  
Professor Simon H. Wender

The elucidation of the metabolic pathways of the male hormones, or androgens, has become extremely important in recent years due to the pronounced influence which these compounds exert on mammalian physiology. Androstanedione occupies a principal position in the metabolic inter-relationships of the androgens.

The incubation of androstanedione with homogenates of male guinea pig liver gave androsterone and epiandrosterone as metabolites. Incubations performed in the presence of certain physiological materials, notably the reduced form of diphosphopyridine nucleotide, gave rise to much greater amounts of epiandrosterone, but not much additional androsterone. A third metabolite, androstanolone, was produced when the level of metabolic conversion was high.

The pH of the medium and the composition of the gaseous phase exerted definite influences upon metabolite formation in the presence of reduced diphosphopyridine nucleotide. The influence of the first-named factor was particularly evident in the case of epiandrosterone. Experiments performed in the presence of nitrogen gave rise to only one-half the quantity of metabolites which was produced in comparable experiments in which air was used.

Incubation of androstanedione with homogenates of male guinea pig kidney, heart, and femoral muscle also gave rise to androsterone and epiandrosterone, except in the case of muscle, which gave rise to epiandrosterone only.

Androstanolone was used as the substrate steroid in a number of experiments with male guinea pig tissue homogenates. Androstanedione was the only metabolite recovered in these experiments. When liver tissue was employed, the conversion of androstanolone was increased by the addition of diphosphopyridine nucleotide. Incubation of androstanolone with homogenates of kidney, testes, and seminal vesicles and prostate gave results similar to those which have been observed with testosterone, the 4,5-dehydro derivative of androstanolone; metabolism was less with kidney than with liver, and was very low or absent with the other tissues. Androstanolone was metabolized to a much lesser extent than testosterone in all of the tissues.

The incubation of fourteen  $C_{19}$ -hydroxysteroids under conditions conducive to oxidation yielded the corresponding ketone compounds; hydroxy ketone compounds were converted to diketones; dihydroxy compounds were converted to hydroxy ketone compounds and to diketones; monohydroxy compounds were not metabolized.

Centrifugal fractionation of guinea pig liver homogenates into fractions consisting of nuclei, mitochondria, microsomes, and "soluble" material gave rise to a purification of testosterone dehydrogenase activity in excess of four-fold in the microsomal fraction. When the mitochondria and the microsomes were separated as a single fraction, a four-fold purification was obtained at the expense of only 10% of the activity originally present in the homogenate. This activity-rich fraction was employed to assay aqueous solutions of testosterone enzymatically. Assays were performed spectrophotometrically at 340 mu. by following the formation of reduced diphosphopyridine nucleotide.

Characterization of the cell component fractions and the homogenates from which they were derived with respect to nucleotide utilization seemed to indicate the presence of two testosterone dehydrogenases in guinea pig liver. Whereas the homogenates utilized both di and triphosphopyridine nucleotide, the activity-rich fraction utilized the former nucleotide only; triphosphopyridine nucleotide utilization was exhibited by the "soluble" fraction.

147 pages. \$1.95. Mic 56-2088

**INHIBITION OF 2-DIACETYLAMINOFLUORENE  
CARCINOGENESIS IN THE RAT**  
(Publication No. 16,847)

Howard Edgar Hoffman, Ph.D.  
Stanford University, 1956

**A. Effect of Tobacco Smoke and Tobacco Tar on  
the Development of the Precancerous State  
in the Liver of the Rat**

Numerous statistical and experimental studies have substantiated claims that smoking may be one of the etiologic factors responsible for the high incidence of human lung cancer. The action of smoke may be assumed to be cocarcinogenic, since a significant number of cases of lung cancer have been observed in minimal or non-smokers. On the other hand, tars collected from tobacco smoke have been stated to contain carcinogenic substances for experimental animals. Many instances of the antagonistic effect of one carcinogen upon another have been cited. In this investigation, demonstration of cocarcinogenic or anticarcinogenic action of smoke and tar was attempted, using the hepatic tumor-producing agent 2-diacetylaminofluorene (DAF) as the primary carcinogen.

DAF was prepared from 2-acetylaminofluorene by refluxing the latter compound in acetic anhydride. Rats were fed a semi-synthetic diet containing 0.05% DAF, and received tobacco smoke or tar (collected by condensing smoke). After eight weeks of ingestion of the carcinogenic diet, animals which had not received smoke or tar had livers which showed more extensive precancerous changes than did those of the smoke- and tar-treated rats. Determination of liver riboflavin revealed a higher concentration in animals receiving smoke or tar than in the non-treated rats, indicating a protective action of the tobacco products against hepatic cancer.

Thus smoke and tar are not cocarcinogenic, but anti-carcinogenic for liver cancer induced by DAF. It is suggested that the mechanism of carcinogenic antagonism, i.e., inhibition of one carcinogen by another, may be involved, or that there are non-carcinogenic inhibitors for chemically-induced liver cancer in the combustion products of tobacco.

**B. Prevention of Hepatic Carcinogenesis by  
Hypophysectomy and Restoration of the Process by  
Hypophyseal Hormones**

Previous experimentalists have demonstrated that hypophysectomy prevented the development of the precancerous or tumorous state in rats fed the hepatic carcinogen 3'-methyl-4-dimethylaminoazobenzene. Administration of adrenocorticotropin (ACTH) restored the process. It was of interest to ascertain whether the carcinogenic action of DAF could be prevented by hypophysectomy.

Hypophysectomized rats were fed semi-synthetic diets containing from 0.05% to 0.08% DAF for as long as twenty-six weeks. However, after twenty-six weeks of feeding the carcinogenic diet, the livers remained normal in the hypophysectomized rats. In some of the latter, histologically confirmed tumors of the Harderian glands developed.

Induction of the precancerous state in hypophysectomized rats was not restored with ACTH (Armour). A prep-

aration of bovine growth hormone stimulated development of the precancerous state in hypophysectomized rats fed DAF for eight weeks. 122 pages. \$1.65. Mic 56-2089

**THE ISOLATION AND PARTIAL  
CHARACTERIZATION OF FLAVICIDIC  
ACID, A PHYTOTOXIC METABOLITE  
OF ASPERGILLUS FLAVUS**

(Publication No. 15,978)

Brian Christopher Warren Hummel, Ph.D.  
University of Minnesota, 1955

A general discussion of certain biochemical aspects of plant pathology is followed by a review of individual diseases with special reference to the production by pathogens of toxins such as lycomarasmin, tabtoxinine and alternaria acid. Work reported in the literature on the phytotoxic action of *Aspergillus flavus* culture extracts upon germinating wheat was confirmed. A study was made of the factors affecting wheat germination, the most important of which were availability of air, availability of moisture, penetration by toxic substances, presence of micro-organisms. By controlling these, an assay for toxicity, based on the degree of inhibition of oxygen uptake by germinating wheat seedlings, was developed.

Submerged shake cultures of *A. flavus* grew rapidly at room temperature and after the third day (when free sugars had disappeared) the medium increased in toxicity. After 11 days the mycelium was removed by filtration. The toxicity of the filtrate was lost on dialysis and was not destroyed by heating to 100° C. for 5 minutes. The toxin was partially extractable by butanol from acid solution. The residue from freeze-drying yielded a highly toxic fraction soluble in absolute ethanol. Toxicity was partially lost on treatment of the culture filtrates with carbon and almost completely lost with anion exchange resins. Cation exchange resins had little effect. A toxin was isolated by the following procedures: (a) alcohol precipitation of relatively inactive material from concentrated aqueous solution, (b) decolorization of the alcohol-soluble fraction with carbon, (c) extraction of inactive material from aqueous solution with chloroform, (d) removal of inactive material by passage through a column of amberlite IR-120 cation exchange resin in the hydrogen form, (e) adsorption of active acids by passage through a column of Duolite A-4 anion exchange column in the hydroxyl form, (f) elution of the anion exchange column with dilute hydrochloric acid and recovery of active acids, (g) resolution of the mixture of acids by partition chromatography first on a silica gel column and then on sheets of thick filter paper, (h) removal of polysaccharide from one of the acids obtained in (g).

The highly toxic acid thus isolated was obtained as a pale yellow solid which could not be induced to crystallize. It was readily soluble in water or absolute ethanol, gave no reaction with ninhydrin, reduced alkaline silver nitrate in the cold and gave an intense red color (absorption maximum 490 mu) upon the addition of ferric salts in aqueous solution. Treatment with oxidizing agents ( $MnO_2$  or  $H_2O_2$ ) in the cold abolished the ability to form a colored iron complex. The presence of an enolic system in the toxin

was indicated by its reversible addition of bromine. On hydrolysis and two dimensional paper partition chromatography, six components reacting with ninhydrin were detected in the hydrolysate. These were tentatively identified as glutamic acid, aspartic acid, glycine, serine, threonine and alanine.

A detailed study of the color reaction with iron showed that maximum stability and color formation at 490 mu occurred between pH 2.0 and 3.5. With an excess of iron, a linear relationship was found between absorbance at 490 mu and toxin concentration. By titration of the toxin with iron the colored complex was shown to be readily dissociable. From the titration data a minimum molecular weight of 227 was calculated, although the presence of the six amino acids in the hydrolysate indicated a value at least twice as great.

Details are given concerning isolation and properties of other acids, one of which was an acidic polypeptide similar to the toxin. 161 pages. \$2.01. Mic 56-2090

#### CHROMATOGRAPHIC AND SPECTRAL STUDIES CONCERNING THE AMINO ACIDS OF ASCORBIC ACID OXIDASE

(Publication No. 17,061)

Donald Monroe Kirschenbaum, Ph.D.  
Columbia University, 1956

A chromatographic and spectral study has been made of the amino acids of the copper containing enzyme, ascorbic acid oxidase.

One and two dimensional paper chromatography has been used to identify the amino acids in acid hydrolysates of ascorbic acid oxidase. The Ninhydrin reagent was used to detect the amino acids. In certain cases specific reagents were also used. Sixteen amino acids have been found and identified. These include glycine, alanine, valine, leucine, isoleucine, serine, threonine, aspartic acid, glutamic acid, phenylalanine, tyrosine, lysine, arginine, histidine, methionine, and proline. The presence of cysteine is doubtful while cystine seems to be present.

Examination of the ultra-violet absorption spectrum of ascorbic acid oxidase in acidic and in basic media shows only the usual type of spectrum for protein material containing the aromatic amino acids, tyrosine and tryptophane. No absorption due to nucleic acids could be detected.

Infra-red examination of potassium bromide pellets of ascorbic acid oxidase reveals a transmission curve which is very similar to the curves obtained using other protein material. Removal of the copper from ascorbic acid oxidase causes the absorption band at 8.1 $\mu$  to vanish. At the present time no explanation can be offered to account for this phenomenon.

The visible absorption spectrum of ascorbic acid oxidase shows two absorption bands. One is at 6060 Å and the other at 4125 Å. The blue color of the enzyme is attributed to the absorption at 6060 Å. On treating the enzyme with ascorbic acid, the blue color is instantly bleached and only a striking golden yellow color remains. Spectrally this change manifests itself in a loss of the 6060 Å band with no change in the 4125 Å band. On oxygenating the yellow solution the blue color returns.

A square coplanar chelate of copper and four imidazole groups of four histidines from the protein chain has been postulated to explain the blue color. This same type of structure supplies a satisfactory explanation for the well known stability of the copper of the enzyme to dialysis and for the high molecular extinction per copper atom.

Ascorbic acid oxidase has been subjected to N-terminal amino acid analysis using Sanger's and Edman's methods. No N-terminal amino acids could be detected with either method. Two possible cyclic structures have accordingly been postulated for ascorbic acid oxidase.

110 pages. \$1.50. Mic 56-2091

#### THE BIOCHEMICAL CONVERSION OF PROGESTERONE TO ORCHIC ANDROGENS

(Publication No. 15,478)

Robert Packard Martin, Ph.D.  
University of Utah, 1956

Chairman: Leo T. Samuels

Previous work had shown that rat testis tissue is capable of converting progesterone to 17 $\alpha$ -hydroxyprogesterone, testosterone, and 4-androstene-3,17-dione (Slaunwhite, W. R. Jr., and Samuels, L. T., *J. Biol. Chem.* in press). It was postulated that 17 $\alpha$ -hydroxyprogesterone is an intermediate in the conversion of progesterone to the two androgens, testosterone and androstanedione, and that an enzymatic hydrolysis of 17 $\alpha$ -hydroxyprogesterone is involved.

The experiments of this thesis were carried out by incubating various tissue preparations of testes obtained from hypophysectomized rats treated with human chorionic gonadotropin (HCG) and from normal immature rats similarly treated. Various enzyme cofactors and steroid substrates were added to the Krebs-Ringer bicarbonate buffer medium, pH 7.2-7.3. After incubation at 34° C., the medium was adjusted to pH 8-9 and extracted with ether. When progesterone-21-C<sup>14</sup> was used as substrate, the extent of enzymatic conversion was measured by the partitioning of radioactivity between the alkaline aqueous phase and the ether phase; this was possible because during the conversion to C<sub>19</sub> androgens the radioactive label of progesterone-21-C<sup>14</sup> was converted to an acid, not yet identified.

Resolution of the ether soluble material was accomplished by paper chromatography. The reversed phase system of Martin and Bush (*Federation Proc.* 14: 252) and the systems of Bush (*Biochem. J.* 50: 370) were used. The former was explained in detail for the first time, and use of a new steroid color reagent, phosphotungstic acid, was presented. Quantitation of steroids was by means of the Cary Recording Spectrophotometer. Qualitative identification of testosterone and androstanedione was also made by use of the Koenig reaction (Koenig, V. L., et al., *J. Biol. Chem.* 141: 487).

It was found that there was a direct correlation between the amount of stimulation by HCG, as indicated by the condition at sacrifice of the seminal vesicles, and the capacity of the testis tissue of the hypophysectomized rat to convert progesterone to androgens. It was shown that

testis tissue is able to convert  $17\alpha$ -hydroxyprogesterone to testosterone and androstanedione but not by hydrolysis as indicated by inhibition of the conversion in nitrogen atmosphere. Addition of phosphopyridine nucleotides to homogenates was necessary for the conversion; DPN and TPN were equally effective. Such addition was necessary also for the conversion of progesterone, although TPN was more effective than DPN. Hence, TPN is postulated as being a cofactor for the synthesis of  $17\alpha$ -hydroxyprogesterone. The latter was not proved to be on the direct route between progesterone and androgens, however.

Inhibition of progesterone conversion in nitrogen was reversed by the addition of ascorbic acid to both a testis homogenate and a testis cell-particle preparation considered to be microsomal. The medium also contained ATP, fumarate, and TPN. The role of ascorbic acid is unknown.

Inhibition of the conversion of progesterone was accomplished by the addition of mercuric ion (0.4 mmolar) in the incubation medium; inhibition occurred also on the inclusion of arsenite (20 mmolar). It is postulated that lipoic acid may be involved in the scission of  $17\alpha$ -hydroxyprogesterone to form  $C_{19}$  androgens.

The data indicated that the  $C_{19}$  compound formed first from such a scission is androstanedione and that reduction of the latter produces testosterone. Androstanedione and testosterone were found to be interconvertible by an enzymatic system which involves phosphopyridine nucleotides. TPN was more effective than DPN when added to a homogenate preparation.

The intracellular location of the enzyme system responsible for the conversion of progesterone to androgens was found by fractional centrifugation to be that portion of the testis homogenate obtained between 8000 x g. and 100,000 x g. Thus, the microsomes were implicated. More definitive work is required.

145 pages. \$1.95. Mic 56-2092

#### STUDIES ON FLAVONOID AND ANTHOCYANIN PIGMENTS (Publication No. 16,762)

Charles Wilbur Nystrom, Ph.D.  
The University of Oklahoma, 1956

Supervisor: Dr. Simon H. Wender

Modern chromatographic techniques for the separation and identification of the flavonoid and anthocyanin compounds have greatly stimulated research on these pigments. Chromatographic techniques have been used to resolve a mixture of flavonoid glycosides into its components. These techniques have also been used in studies undertaken to determine the possible role of the flavonoid and anthocyanin pigments in plants.

The supposedly pure xanthorhamnin obtained commercially has been separated by a new paper chromatographic system into its three major component glycosides. Two of these glycosides have been characterized as xanthorhamnin and methyl xanthorhamnin. The third glycoside has been found to be a derivative of quercetin containing two moles of rhamnose to one mole of galactose.

In studies on the action of the hydrolyzing enzymes, emulsin and alpha glucosidase, it has been found that the flavonoid glucosides isoquercitrin, hesperetin 7-glucoside, naringenin 7-glucoside, and a quercetin glucoside from apricots, were hydrolyzed by emulsin but not by the alpha glucosidase. The linkage of the glucose to the aglycone must, therefore, be of a beta configuration in these glucosides.

Tyrosinase was found to be inactive, under the conditions studied, in introducing an ortho-hydroxyl group into the side phenyl ring of flavonoid compounds containing a mono-hydroxy group on this side phenyl ring. These results cast doubt on the assumption that the enzyme tyrosinase would be capable of converting flavonoids of the mono-hydroxy side phenyl ring configuration to the corresponding di-hydroxy side phenyl ring compound *in vivo*.

An unidentified compound found in sedoheptulose-C<sup>14</sup> studies by Tolbert and Zill has been identified in this thesis research as beta-phenylglucoside. It was formed in the detoxification of traces of phenol contaminating the biosynthesized sedoheptulose-C<sup>14</sup> solutions. The fact that the plant detoxified phenol by forming a glucoside is some evidence in support of the theory that the anthocyanin and flavonoid aglycones may be side metabolic products which are detoxified by the formation of glycosides.

The rate of C<sup>14</sup>O<sub>2</sub> fixation found in an anthocyanin-containing section of a *Coleus* leaf as compared to an anthocyanin-free section of the same leaf in red and green light supported the filter effect theory reported by Gabrielsen. The rate of C<sup>14</sup>O<sub>2</sub> fixation was directly proportional in red light to the chlorophyll content of the two sections. In green light, the rate was much lower in the anthocyanin section than in the anthocyanin-free section of the leaf.

Studies utilizing the same *Coleus* leaf, after treatment with ultraviolet light, failed to reveal any protective action against the ultraviolet light on the part of the anthocyanin pigments. In fact, the anthocyanin-sections appeared to be more sensitive to the effect of the ultraviolet light than were the anthocyanin-free sections of the leaf.

A complex of a protein with a flavonoid-like substance has been isolated from extracts of spinach and corn leaves. The presence of flavonoid was not established rigorously, but a substance which was bound to the protein gave several typical flavonoid reactions. The close association of the flavonoid-like compound and the protein suggests that the complex may have some enzymatic function in the plant. 100 pages. \$1.25. Mic 56-2093

#### ASSAY METHODS FOR THE DETERMINATION OF PROTEIN QUALITY (PARTS I AND II)

(Publication No. 16,687)  
John Joseph Pisano, Ph.D.  
Rutgers University, 1955

Part I. Growth Response of the Confused Flour Beetle Larva, *Tribolium confusum* Duval, and the German Cockroach, *Blatella Germanica* (L),

on Six Nutritionally Different and Carefully Tested Proteins.

A study was made of the value of certain insects as test organisms for determining protein quality on a micro-scale. Nymphs of the German cockroach and larvae of the confused flour beetle were fed diets in which the protein was furnished by samples of casein, beef, whole egg, egg albumen, wheat gluten, and peanut flour which had previously been carefully assayed in an extensive cooperative experiment.

A complete purified diet, limiting only in protein, was fed to the insects. Response was determined from weight, age at maturity, and survival, with the three criteria showing good general agreement.

With cockroaches at the 18% protein level, egg albumen was clearly the best protein and whole egg the poorest. Beef, gluten, casein, and peanut flour were intermediate and decreased in that order but the differences were slight. Flour beetle larvae at the same protein level showed a wider range and a different order of responses. Beef and casein were good, peanut flour intermediate and wheat gluten very poor. Supplementation of gluten with 1% lysine made it almost as good as whole wheat, whereas 0.5% methionine had no effect on the peanut flour diet. Both egg proteins were poor, but whole egg was better than albumen, suggesting a toxic agent which was more concentrated in egg white. Autoclaving, extra biotin, yeast, casein, or amino acids failed to overcome the toxicity.

At the 24% protein level, responses were almost universally better and the order was somewhat different. With roaches, peanut, beef, and albumen were almost as good as the dog food control diet. Gluten and casein were intermediate and whole egg again the poorest. Flour beetles showed an excellent response to peanut flour, better than to 24% beef and casein and equal to the control of the whole wheat. Whole egg, gluten, and egg albumen were inferior with albumen the poorest.

The superiority of flour beetle larvae over cockroaches and protozoa as assay organisms for the relative biological evaluation of proteins on a micro-scale is discussed. Other possible uses of the larvae are suggested.

## Part II. Extraction of Plant Proteins with Sodium Lauryl Sulfate.

This research was undertaken to develop a method for the complete extraction of plant proteins.

Weighed, defatted samples (200 mesh) were mechanically shaken at controlled temperatures with exact volumes of extractants. Nitrogen dispersed was determined from Kjeldahl determinations on the original sample and centrifuged aliquots of the extract.

Various combinations of 1% sodium lauryl sulfate (SLS), sodium carbonate buffer (pH 10.3), 0.2% NaHSO<sub>3</sub>, and 0.014N NaOH were used. Extraction with SLS + buffer + bisulfite for 24 hours at 37° C gave at least 98% extraction of the nitrogen of wheat, soybeans, peas, oats, corn, and chick starter mash ration. Temperature could be lowered to 20° C and time to 1 hour without any decrease in the extraction.

With soybeans and wheat, buffer and bisulfite could be omitted without affecting the percent extraction, and NaOH was also found to give excellent results. With corn, only

83 - 90% extraction was obtained with the different combinations. With all samples, buffer, buffer + bisulfite or bisulfite alone, were much less effective than 1% SLS. Detergent was just as effective at pH 2.8 as at pH 10.3.

As much as 90 - 95% of the extracted soybean protein could be precipitated with trichloroacetic acid, detergent, or perfluorooctanoic acid (95%).

The results show that sodium lauryl sulfate should be added to the list of effective protein extractants.

135 pages. \$1.80. Mic 56-2094

## FACTORS INFLUENCING EMERGENCE OF LARVAE OF THE GOLDEN NEMATODE (HETERODERA ROSTOCHIENSIS WOLLENWEBER)

(Publication No. 17,008)

Trevor Robinson, Ph.D.  
Cornell University, 1956

The golden nematode, an important parasite on potatoes, is of interest since its encysted stage is able to remain viable in the soil for many years until larval emergence is stimulated by a chemical excreted by roots of the host plant. This study deals with attempts to purify and determine the chemical nature of this stimulant as well as to define other ecological factors which might influence larval emergence.

The effect of pH on larval emergence was studied by incubating golden nematode cysts in solutions of various acidities, adjusted in most cases with hydrochloric acid. In some experiments organic acids were also used. After one week of incubation larvae and cysts were counted and results recorded as larval emergence per cyst. There was a consistent large stimulation of hatching at values between pH 2 and 3 with a rapid dropping off of effect on both sides of this range and complete inhibition at pH 1. The same pH optimum was observed with several different acids and clearly was dependent on acidity rather than on the specific anion.

Leachings from the soil in which tomato plants were growing were very active in stimulating larval emergence. These leachings were partially deionized by treatment with ion exchange resins to remove all cations and strong anions. The "deionized" fraction which contained weak anions as well as neutral substances was found to have less stimulatory activity than the original leachings. However, adding back the removed cations as their chlorides completely restored the original activity. A known mixture of calcium, magnesium, sodium, and potassium chlorides was also able to replace the natural cations in this respect. The cation chlorides alone showed negligible stimulatory activity so that the actual stimulant was tentatively identified as a neutral compound or a weak acid. The effect of other inorganic salts on larval emergence was also studied and zinc and cadmium salts were shown to inhibit emergence strongly.

Purification of the hatching stimulant was undertaken by lyophilization of "deionized" leachings, extraction of the residue with absolute alcohol, and precipitation of impurities with ethyl ether. Preparations obtained in this way showed high activity. Paper chromatography indicated the presence of only one active spot which was acidic.

It is concluded that the stimulant is probably an organic acid, but it has not been obtained as a pure substance.

Experiments with tomato plants grown under aseptic conditions showed that they excreted the hatching stimulant into the medium thereby ruling out any possible symbiotic relationship with microorganisms in production of the stimulant.

The effect of various common enzyme inhibitors on larval emergence was studied. Azide, cyanide, fluoroacetate, and p-chloromercuribenzoate inhibited almost completely. Beryllium ion, thiouracil and diethyldithiocarbamate inhibited to a lesser extent.

78 pages. \$1.50. Mic 56-2095

#### PRODUCTS OF NICOTINE DEGRADATION BY C. NICOTINOVORUM

(Publication No. 16,735)

William S. Wadsworth, Jr., Ph.D.  
The Pennsylvania State University, 1956

An essential step in the transformation of crude cigar tobacco leaves into an acceptable product is the process of fermentation. One of the main functions of the process is the lowering of the nicotine content of tobacco. The alkaloid is converted into nonvolatile compounds giving a milder and more pleasing product.

Until the last few years the role of bacteria in tobacco fermentation had been underestimated. From research carried out at this university, it is now known that bacteria are important agents in the fermentation process. It was the object of this study, therefore, to determine the nature of some of the intermediate compounds which arise from the bacterial degradation of nicotine, the main tobacco alkaloid.

Corynebacterium nicotinovorum, previously isolated from fermenting tobacco, had been found to be one of the most effective nicotine-decomposing bacteria. This organism was used throughout the course of this study. The microbial degradation was conducted in two liter batches, using a phosphate medium, with nicotine as the only carbon source.

Ultra-violet spectral-transmission curves indicated that two intermediate compounds were formed. One had an absorption peak at 230 mu and a second had a maximum absorption at 289 mu. Two nonvolatile compounds with the above characteristic absorption peaks were isolated from the medium, the first being a forerunner of the second. The isolation and purification involved precipitating the intermediates as their silicotungstic acid salts. The compounds were liberated from their salts by hydrolyzing with barium hydroxide. The products were amorphous, hygroscopic resins which turned dark quickly on standing.

Although the apparent reactivity and ease of polymerization made the identification of the intermediate compounds difficult, their structures were elucidated. The first compound was found to be N-methyl-2-(3-pyridyl)-1-pyrrolinium hydroxide while the second was N-methyl-2-(3-pyridyl)-1,4-pyrrolinium hydroxide.

The structures were determined in a number of ways. Tests for functional groups gave negative results. Oxidation of either intermediate gave nicotinic acid while the

reduction of the second intermediate gave the first and continued reduction gave nicotine. The experimentally determined molecular weights of the intermediates were close to the theoretical values. Decomposition of the compounds gave known products which were consistent with the postulated structures. Finally, the ultra-violet and infra-red spectra of the intermediates followed closely those of known compounds with similar structures.

Thus, the degradation of nicotine during the early stages of the fermentation process takes place by the removal of four hydrogen atoms from the pyrrolidine ring of nicotine. Although nicotinic acid and other nicotine derivatives which arise during fermentation were not found, their formation from the new nonvolatile compounds by enzymatic or non-enzymatic catalysts would be an easy process.

The bacteria were found not to contain either of the intermediate compounds indicating that the first few steps in the nicotine degradation were probably surface reactions. The purple bacterial pigment which appeared during the course of the fermentation was characterized and found to be an unsaturated acid containing nitrogen and possibly having aromatic character. Carbon dioxide and ammonia were evolved during the reaction. The amounts liberated accounted only for the degradation of the pyrrolidine ring of nicotine.

#### VITA

William S. Wadsworth, Jr. was born May 6, 1927 in Farmington, Connecticut. He graduated from Kingswood School in 1946. After receiving B.S. and M.S. degrees in chemistry from Trinity College in 1950 and 1952, respectively, he was employed for one year by the Union Carbide and Carbon Corp. In September 1953 he matriculated at The Pennsylvania State University and was granted the Ph.D. degree in Agricultural and Biological Chemistry in January 1956.

76 pages. \$1.00. Mic 56-2096

#### CHEMISTRY, INORGANIC

##### CHEMICAL ANALYSIS BY RESONANCE ABSORPTION OF NEUTRONS

(Publication No. 17,091)

Robert Hunt Anderson, Ph.D.  
Columbia University, 1954

The resonance absorption of neutrons was investigated as a new method of chemical analysis. The relationships between the thickness, mg/cm<sup>2</sup>, of the element to be determined, and the neutron transmission curve are discussed using the Breit-Wigner one-level formula for absorption. Five characteristics of resonance dips in neutron transmission curves are defined and examined in detail. The theoretical errors of each characteristic are studied under comparable conditions, and finally two characteristics are chosen as being of greatest potential value. The second characteristic is believed to be the

best and is the area under the  $1 - T$  curve and between limits. The best limits to use are in the vicinity of  $\pm 0.15$  in terms of the dimensionless parameter,  $x = \frac{t - t_0}{t_0}$ , where  $t$  is the neutron time of flight and  $t_0$  is  $t$  at exact resonance. The fourth characteristic is easier to apply and the precision in an analysis is almost as good. It is the product of  $(1 - T_{\min})$  and the 0.75 power of the width of the dip at a transmission of  $\frac{1 - T_{\min}}{2}$ .

The transmission curves were obtained by means of the Columbia neutron velocity spectrometer, N.V.S. The effect of the instrument settings on the errors of the characteristics were studied.  $\tau_t$ , the total cycle time, should be as small as possible without causing overlap of the resonance dip by preceding or succeeding cycles.  $\tau_d$ , the time of a detection interval, should be as small as possible with the restriction that the detection chain cover the entire energy range to be used in obtaining the area. The optimum value of  $\tau_a$  depends upon the precision desired and is, within the range studied, approximately proportional to the desired standard deviation in the result.

Samples of 0.01% to 0.5% indium in tin, hafnium in zirconium, and gold electroplated on copper were measured on the N.V.S. The results of analyzing each experimental curve by means of the five characteristics are compared with the results of other methods of analysis. The optimum concentration range for indium in a matrix of low constant cross section is 0.01 to 0.5%. This new method of analysis can be applied, with a precision of about 5%, to elements with large resonances for slow neutrons. These include In, Hf, Au, Gd, Cd, Eu, Dy, Co, Ir, Mn, Rh, Sm, Ag, U, and Ta.

A brief introductory study of the possibility of using a radium-beryllium source in a neutron self-detector transmission experiment was made using the indium in tin samples. The half saturation activity of the detector foil varies in a linear manner with the log of the concentration of In. A relative precision in the analysis of indium in tin of about  $\pm 15\%$  can be obtained by making a working curve for a series of standards of varying percent compositions. Standards and samples must be identical in size and shape and must be measured under conditions of fixed geometrical arrangement of source, sample, and foil.

170 pages. \$2.25. Mic 56-2097

#### A STUDY OF THE REACTIONS OF DIBORANE WITH METHYL SUBSTITUTED HYDROXYLAMINES AND WITH PHOSPHORUS TRIFLUORIDE

(Publication No. 17,416)

Thomas Charles Bissot, Ph.D.  
University of Michigan, 1956

Evidence now available suggests that many of the reactions of diborane proceed through the formation of a  $\text{BH}_3$  addition compound, which may undergo secondary decomposition to give a variety of products. Borane adducts of hydroxylamine derivatives are subject to many secondary reactions and, hence, are of particular interest in outlining the chemistry of diborane.

In this investigation, diborane was allowed to react

with methyl substituted hydroxylamines and the properties, stability, and mode of decomposition of the resulting adducts determined. In addition, the reaction of the very weak "Lewis" base,  $\text{PF}_3$ , with diborane was studied in an attempt to prepare a compound  $\text{PF}_3\text{BH}_3$ . A typical high vacuum apparatus was employed in manipulating these materials.

The melting points, vapor pressure curves, and Trouton constants were measured for all of the methyl substituted hydroxylamines. The values observed are what one would expect from the hydrogen bonding in these molecules. The base strengths of these compounds were measured in aqueous solution.

These methyl substituted hydroxylamines react with diborane in a 2/1 ratio to form a borane addition compound. The stoichiometry of the reaction was very good for the  $\text{OCH}_3$  hydroxylamines but small deviations were observed for the  $\text{OH}$  hydroxylamines. These addition compounds undergo secondary reactions before there is any observable dissociation back into the amine and diborane. It was found that the hydroxylamines could be displaced from their borane addition compounds by trimethylamine, the displacement being quantitative for the trimethyl derivative.

$\text{CH}_3\text{ONH}_2\text{BH}_3$  and  $\text{CH}_3\text{ONHCH}_3\text{BH}_3$  explode upon rapid heating to  $100^\circ$ , but decompose slowly at lower temperatures to liberate hydrogen gas. The hydrogen evolution is accompanied by a shift of the methoxy group from the nitrogen to the boron and a shift of a hydride unit from the boron to the nitrogen. Following disproportionation, trimethoxyborane can be isolated from the decomposition products. The trimethylhydroxylamine-borane also undergoes this shift and disproportionation but does not explode upon rapid heating. A different decomposition mechanism is proposed for this compound.

When  $\text{CH}_3\text{ONH}_2\text{BH}_3$  and  $\text{CH}_3\text{ONHCH}_3\text{BH}_3$  are hydrolyzed by 50% KOH, a hydridic hydrogen is lost from the boron and reduction of the amine occurs. The behavior appears to parallel the thermal decomposition of these compounds. On the other hand, when  $\text{CH}_3\text{ON}(\text{CH}_3)_2\text{BH}_3$  is hydrolyzed by a basic solution, three hydridic hydrogens per boron are found and the original  $\text{O},\text{N},\text{N}$ -trimethylhydroxylamine is recovered unchanged. The difference is ascribed to the partial ionization of these ammonium type compounds in strongly alkaline solutions.

$\text{HONHCH}_3\text{BH}_3$  and  $\text{HON}(\text{CH}_3)_2\text{BH}_3$  lose hydrogen at low temperatures when they are prepared using an excess of diborane. The dimethyl derivative is found to be surprisingly stable at  $25^\circ$  when it is pure, but when heated up to  $55^\circ$ , it loses one mole of hydrogen to leave an  $(\text{ON}(\text{CH}_3)_2\text{BH}_2)_n$  polymer. Diborane catalyzes the decomposition at room temperature. The stability of pure  $\text{HON}(\text{CH}_3)_2\text{BH}_3$  is attributed to deactivation of the hydridic hydrogens through coordination of the borane group.

The compound  $\text{PF}_3\text{BH}_3$  has been prepared by the reaction between phosphorus trifluoride and diborane. The properties of this compound are very similar to those reported for  $\text{OCBH}_3$ . 134 pages. \$1.80. Mic 56-2098

## THE RADIOLYSIS OF LIQUID AND

SOLID ALKYL IODIDES

(Publication No. 17,315)

Evalyn Ortelt Hornig, Ph.D.  
The University of Wisconsin, 1956

Supervisor: Professor John E. Willard

Reports in the literature on the radiolysis and the photolysis of liquid alkyl iodides indicate that  $I_2$  is formed by a hot reaction which is unaffected by the  $I_2$  and other reaction products formed. They also indicate the presence of thermal organic radicals which can exchange with radio-iodine. The purpose of the present work was threefold: (1) to determine whether the accumulation of products at high total dosage affects the rate of  $I_2$  production, (2) to study the role of thermal radicals in the radiolysis processes by adding  $O_2$  and  $II^{131}$  prior to irradiation, and (3) to see if the  $I_2$  formation is influenced by a change in state or by changes of temperature.

Degassed samples of seven alkyl iodides were irradiated with gamma rays from a 40 curie  $Co^{60}$  source, at a rate of energy absorption of  $2 \times 10^{19}$  ev per ml. per hour. The iodine formed was measured spectrophotometrically between successive irradiations on the same sample. At low total dosage the G values for iodine production (I atoms formed per 100 ev absorbed) ranged from 1.89 for isobutyl to 5.36 for isopropyl iodide. The relative yields for the series were similar to those reported for the photolysis and X-irradiation of the alkyl iodides, and were a function of the number of hydrogen atoms on the  $\beta$  carbon atoms.

In all the iodides except methyl iodide the G values decreased with increasing amount of total energy absorbed when irradiations were continued to a total dosage of  $2 \times 10^{21}$  ev per ml., or to an iodine concentration of  $0.03\text{ M}$  if that was reached first. The decrease in G values occurred at different  $I_2$  concentrations for the various iodides studied; for example, ethyl iodide had a constant G value to about  $0.015\text{ M } I_2$ , whereas the initially observed rate for isobutyl iodide was non-linear.

Irradiations of liquid alkyl iodides at  $-78^\circ$ ,  $20^\circ$  and  $108^\circ\text{ C.}$  showed the rate of iodine production to be independent of temperature in the liquid phase. In the solid phase the iodine G values obtained from glasses were consistently higher than from the crystalline form of the same compounds irradiated at the same temperature, and the rates in crystalline solids were temperature dependent.

The mechanism proposed in this thesis for the radiolysis of the alkyl iodides includes two paths for the formation of iodine, a hot radical mechanism, and an initial dehydrohalogenation of the iodides, occurring at a constant ratio of about 8 to 1 in ethyl iodide. HI was detected as one of the products of the radiolysis, and HI can produce iodine by reacting with thermal radicals. There is evidence for the competition of HI and  $I_2$  for radicals in the observation that  $I_2$  added prior to irradiation resulted in a lower rate of  $I_2$  formation than the same  $I_2$  concentration produced during the radiolysis.

When ethyl iodide was irradiated in the presence of oxygen, the initial rate of iodine formation was about twice the rate in degassed samples and gradually decreased to the same rates although the concentration of oxygen was not significantly depleted. These observations are consist-

ent with a mechanism whereby oxygen reacts with thermal radicals preventing the reaction of an equivalent amount of  $I_2$ . Results from irradiations of samples containing both  $I_2$  and  $O_2$  added prior to irradiation support the theory of competition of  $I_2$  and  $O_2$  for thermal radicals. A ratio of 6 to 1  $I_2$  to  $O_2$  initially present eliminated the increased rate of iodine formation observed when only  $O_2$  was added. Also, high ratios of  $O_2$  to  $II^{131}$  added to ethyl iodide greatly reduced the exchange of activity which, in the absence of  $O_2$ , had a G value of 1.6 times the G value for I atom formation.

124 pages. \$1.65. Mic 56-2099

## CHEMISTRY, ORGANIC

AN INVESTIGATION OF THE UNSATURATED  
FATTY ACIDS OF BUTTERFAT

(Publication No. 17,375)

Richard Harold Backderf, Ph.D.  
The Ohio State University, 1956

Oleic acid prepared from butterfat by the usual means displays a melting point that is several degrees lower than the melting point commonly accepted for pure oleic acid. The object of the research was, therefore, to investigate the mixed nature of butterfat "oleic" acid and, in a more general way, to investigate the positional and geometrical isomerism of the various unsaturated acids of this fat. Toward this end a chromatographic analytical procedure was adopted which permitted the quantitative analysis of mixtures of homologous dicarboxylic acids with from seven to twelve carbon-atoms. Such acids would be expected from the oxidative cleavage of unsaturated fatty acids.

Pure oleic acid or ester was used to test several of the available oxidative double bond cleavage reactions. From the standpoint of completeness and cleanliness of reaction, cleavage with  $KMnO_4$  in acetic acid or with ozone was found to be the most satisfactory.

Oxidation of a known mixture of positionally isomeric unsaturated fatty acids, followed by a chromatographic separation of the dicarboxylic acids resulting from such an oxidation, indicated that a satisfactory method of cleavage analysis had been established. By this method the mole per cent composition of such a mixture could be ascertained with a maximum error of  $\pm 4$  per cent. Used in conjunction with established optical methods of analysis, this cleavage analysis has been applied to an investigation of the composition of the  $C_{16}$  and  $C_{18}$  fatty esters of butterfat.

The total methyl esters obtained from a sample of Ohio summer butterfat were separated into carbon series by fractional distillation, and the  $C_{18}$  esters were further fractionated by a series of crystallizations from methanol at low temperatures. The various fractions so obtained were subjected to cleavage analysis in order to determine the positions of the double bonds of the unsaturated esters, and to infrared analysis to determine the configuration of these bonds. One small fraction was obtained whose solubility was intermediate between that of methyl stearate and

methyl oleate. Only one-fourth of the esters present in this fraction were unsaturated, but all of these unsaturated esters had the trans configuration. Cleavage analysis proved that 60 per cent of the unsaturation was due to the presence of vaccenic (trans-11-octadecenoic) acid, while 40 per cent was due to a unique acid (trans-16-octadecenoic) which had not previously been reported as naturally occurring. This new acid is believed to be present to the extent of 1-2 per cent of the total butterfat fatty acids, and was identified by the isolation of 1,14-tetradecanedicarboxylic acid from the cleavage products. The identity of the di-carboxylic acid was established by its melting point, mixed melting point with an authentic sample, equivalent weight, carbon-hydrogen analysis, and the melting point and mixed melting point of its dianilide derivative.

Similar analyses of other crystal fractions indicated that 11-octadecenoic acid was present to the extent of 3-4 per cent of the total butterfat fatty acids. While this acid was mostly trans (vaccenic), evidence was offered for the presence of 1 per cent cis-11-octadecenoic acid as well. In addition, some evidence was presented for the occurrence of trace amounts of elaidic acid. The presence of diunsaturated acids isomeric with linoleic acid (cis-9,cis-12-octadecadienoic) was detected, but the identity and prevalence of these acids were not determined.

The C<sub>18</sub> acids were investigated by a similar scheme of analysis. Over 50 per cent of the hexadecenoic acids of butterfat were found to have the trans configuration, but no positional isomers of 9-hexadecenoic acid were found to be present. The previously unreported trans-9-hexadecenoic acid would account for 0.04 per cent of the total fatty acids in butterfat.

103 pages. \$1.50. Mic 56-2100

#### LIGHT SCATTERING AND VISCOSITY STUDIES ON FRACTIONATED POLY-4-VINYLPYRIDINE

(Publication No. 16,673)

Allan Grant Boyes, Ph.D.  
Rutgers University, 1956

Despite the fact that poly-4-vinylpyridine has been used extensively in the preparation of cationic poly-electrolytes and polysoaps, very little is known about those of its properties which control its molecular dimensions in solution. These properties are the intrinsic flexibility of the poly-4-vinylpyridine chain and the interaction of the chain segments with the solvent molecules. In order to learn something about these properties, the molecular dimensions, weights, and interactions of several fractionated samples of poly-4-vinylpyridine were determined by viscosity and light scattering studies.

Five samples of poly-4-vinylpyridine were prepared from freshly distilled 4-vinylpyridine using benzoyl peroxide as a catalyst and toluene as a solvent. The intrinsic viscosities in 92 wt. % ethanol ranged from 0.94 to 2.12. Each sample was fractionated into a high, a medium and a low molecular weight fraction using tertiary butyl alcohol as a solvent and benzene as a non-solvent. The fractions that were close in intrinsic viscosities were combined and fractionated so as to obtain large middle fractions. The intrinsic viscosities of these in 92 wt. % ethanol ranged from 0.427 to 3.72. Another fraction obtained from Mr.

Bernard Williams had an intrinsic viscosity of 5.05 in the same solvent.

An Aminco Light Scattering Photometer was used for the light scattering measurements. The best optical arrangements for the measurements of turbidity, depolarization and angular diffraction were obtained using appropriate solvents and polymer solutions. The calibration constant was obtained by using a toluene solution of Cornell polystyrene of known turbidity.

The molecular weights of the poly-4-vinylpyridine samples were determined by light scattering in a 14 wt. % solution of isopropyl alcohol (IPA) in methyl ethyl ketone (MEK) because this solvent was found to be close to the theta-point at 25° C. Viscosities were determined in this solvent, and also in 92.01 wt. % ethanol. The following molecular weight-viscosity relationships were established:

$$[\eta] = 3.8 \times 10^{-4} M^{0.57} \text{ in 86:14 MEK:IPA and}$$

$$[\eta] = 1.20 \times 10^{-4} M^{0.73} \text{ in 92.01 wt. % ethanol.}$$

The constant, K, of Flory's relation  $[\eta]_0 = KM^{0.5}$  was determined by (1) plotting  $[\eta]^{2/3} / M^{1/2}$  against  $M / [\eta]$  using the data for poly-4-vinylpyridine fractions obtained in 92.01 wt. % ethanol and 86:14 MEK:IPA solutions, and (2) by plotting  $[\eta]$  against B, the experimentally determined second virial coefficient, using the data of one sample of unfractionated poly-4-vinylpyridine obtained in four different solvents. K was found to be  $8.1 \times 10^{-4}$  by the two independent methods. This is very close to Flory's value of  $8.3 \times 10^{-4}$  for polystyrene at 25° C.

The root-mean-square end-to-end distances, R, of poly-4-vinylpyridine samples in 86:14 MEK:IPA were determined both by light scattering dissymmetry and by viscosity measurements. The values of R from dissymmetry measurements were generally somewhat larger. In all cases the difference was less than 15%.

Values of the second virial coefficient, B, obtained from light scattering data were compared with theoretical values calculated from viscosity and molecular weight data using a relation proposed by Flory. Close agreement was obtained for the larger values of B. However, for the smaller values of B, where  $\alpha$  is near unity, a relation proposed by Stockmayer gave better results.

144 pages. \$1.80. Mic 56-2101

#### I. THE DECOMPOSITION OF CIS- AND TRANS-2-STILBENEDIAZONIUM FLUOBORATES.

#### II. SOME ASPECTS OF THE STEREOCHEMISTRY OF NINE MEMBERED CARBON RINGS.

(Publication No. 15,585)

Yun-Wen Chu, Ph.D.  
Cornell University, 1955

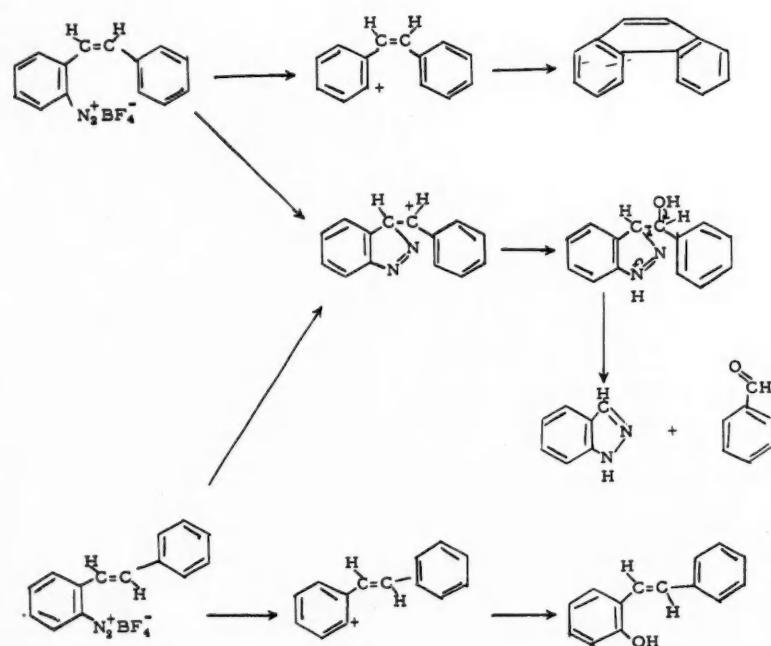
#### I.

This study was undertaken to elucidate the mechanism of the thermal decomposition of some aromatic diazonium salts in acid medium.

The syntheses of cis- and trans-2-stilbenediazonium fluoborates were carried out and these compounds were

subjected to decomposition in dilute aqueous sulfuric acid medium, at 25, 35, 45 and 100°C. The products were isolated by chromatographic separation and identified by their infrared absorption spectra and melting points. From the *cis*- compound the main products were found to be phenanthrene (15-40%), resulting from ring closure, indazole (60-70%) and benzaldehyde, due to the cleavage of the double bond. From the *trans*- compound, the main products were *trans*-2-hydroxystilbene, indazole and benzaldehyde. The rates of these reactions have been followed manometrically by measuring the rate of nitrogen evolution, and were found to be accurately of first order in the concentration of the diazonium salt.

These results indicate that although parallel reactions are occurring simultaneously, all the reactions by which the diazonium salt disappears are first order. The following mechanisms for the decomposition reactions are proposed.



The rate constants and activation energies of these reactions have been calculated.

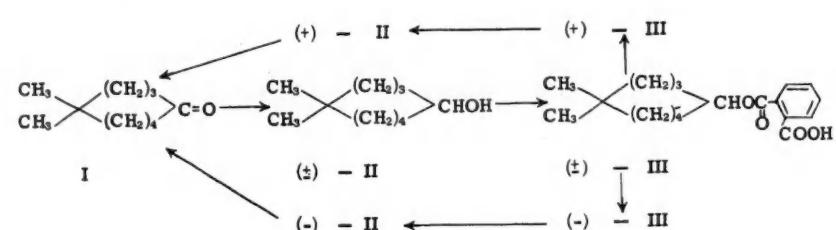
## II.

Inspection of molecular models reveals that certain substituted cyclononane derivatives are dissymmetric due to restricted rotations about carbon carbon single bonds. These compounds offer a good opportunity for the investigation of the flexibility of medium sized ring compounds. If the rings are rigid enough to retain their dissymmetric conformations, it should be possible to isolate optically active stereoisomers. On the other hand, if the energy of interconversion between the enantiomorphs is low, they should always behave as one single compound.

The compounds chosen for study were 5,5-dimethylcyclononanone (I), and 6-acid phthalamido-2,3-heptamethylenequinoxaline (IV). These compounds were synthesized via routes involving the acyloin condensation to form nine-membered rings.

The direct resolution attempts carried out with I using (+)- and (-)- $\alpha$ -phenylethylsemicarbazide and (+)- $\alpha$ -phenylethylsemioxamazide as carbonyl resolving agents gave no indication of the separation of stereoisomers, although well characterized optically active derivatives

were obtained. Conversion of I to the corresponding alcohol, 5,5-dimethylcyclonanol (II) and the resolution of II has been achieved. II was converted into its acid phthalate (III) which was resolved with (+)- and (-)- $\alpha$ -phenylethylamine. On hydrolysis of the optically active acid phthalates (III), (+)- and (-)-5,5-dimethylcyclonanol (II), were obtained. Mild oxidation of (+)- and (-)-II afforded optically inactive I.



Several 6-substituted-2,3-heptamethylenequinoxalines have been synthesized and characterized. The direct resolution attempts on IV with brucine, cinchonidine, quinine and (+)- $\alpha$ -phenylethylamine afforded no separation.

As a result of this study it is concluded that although the nine-membered carbon rings exhibit some unique characteristics attributable to internal strain, they are incapable of retaining their conformations at room temperature. An equilibrium between various conformations is always attained. The Fisher-Taylor-Hirschfelder models do not present a true picture of the internal mobility of these molecules. 121 pages. \$1.51. Mic 56-2102

## STERIC EFFECTS AND MIGRATION APTITUDES IN THE REARRANGEMENT OF AMINO ALCOHOLS

(Publication No. 17,093)

Malcolm Charles Crew, Ph.D.  
Columbia University, 1954

The two diastereoisomers of 1-p-anisyl-1-phenyl-2-aminopropanol (I) have been prepared by previously described methods, and the products of their reaction with nitrous acid have been examined. Erythro-I was prepared by the reaction of p-methoxyphenylmagnesium bromide with  $\alpha$ -aminopropiophenone hydrochloride, and threo-I by the reaction of phenylmagnesium bromide with  $\alpha$ -amino-p-methoxypropiophenone hydrochloride. The reaction of erythro-I with nitrous acid yielded a ketone mixture which was preponderantly 4-methoxy- $\alpha$ -methyldesoxybenzoin (II), formed by migration of the phenyl group, though, contrary to previous reports, a small amount (12% of the total ketonic fraction) of 4'-methoxy- $\alpha$ -methyldesoxybenzoin (III) was also formed. Threo-I yielded a ketone mixture which was preponderantly III, formed by migration of the p-anisyl group, though the formation of a small amount (6%) of II was also observed. These results are interpreted to indicate that, in this reaction, the p-anisyl group showed a preference for migration over the phenyl group by a rate factor of 1.5, whereas, the steric effects in the reaction introduced a controlling rate factor of 11.

The rearrangements of four 1,1-diaryl-2-aminoethanols have been investigated in order to determine the competitive preferences for the migration of aryl groups in the

absence of product controlling steric effects. The reactions of 1-p-anisyl-1-phenyl-2-aminoethanol (IV) and 1-phenyl-1-p-tolyl-2-aminoethanol (V), which were previously reported to have rearranged with exclusive migration of the p-anisyl and p-tolyl groups respectively, have been reexamined. Contrary to the previous reports, it was observed that IV yields a mixture of two ketones corresponding to a p-anisyl/phenyl migration ratio of 1.6, and V yields a mixture of two ketones corresponding to a p-tolyl/phenyl migration ratio of 1.3. The rearrangements of two other amino alcohols, 1-p-chlorophenyl-1-phenyl-2-aminoethanol (VI) and 1-p-anisyl-1-p-tolyl-2-aminoethanol (VII) similarly led to migration ratios of 0.9 for p-chlorophenyl/phenyl and 1.2 for p-anisyl/p-tolyl.

The migration ratios observed in these experiments are discussed in terms of other reactions involving similar migrations.

The compositions of the ketonic mixtures obtained were determined from their ultraviolet spectra. The data necessary for the analyses were obtained from pure samples of the corresponding ketones obtained by an independent synthetic route. The major components of the mixtures obtained from the rearrangements of I were isolated and identified with the corresponding synthetic samples. The mixtures obtained from the rearrangements of IV, V, VI, and VII were identified, by means of their infrared spectra, with mixtures of the corresponding pure ketones in the proportions indicated by the ultraviolet analyses.

116 pages. \$1.50. Mic 56-2103

#### THE MECHANISM OF THE PARA-CLAISEN REARRANGEMENT

(Publication No. 17,095)

Raymond A. Firestone, Ph.D.  
Columbia University, 1954

Phenyl allyl ethers having unsubstituted ortho-positions rearrange upon pyrolysis, yielding ortho-allyl phenols. The reaction proceeds via a six-membered transition state, with the  $\alpha$ -carbon of the O-allyl group departing from the oxygen at the same time that the  $\gamma$ -carbon attaches to the ortho-position. When both ortho-position are blocked with alkyl groups, migration to the para-position occurs under the same conditions. Several mechanisms are compatible with the published data.

It was believed that the para migration proceeds via two successive rearrangements of the ortho type. Thus, 2,6-dimethyl phenyl allyl ether (I) would yield successively, 2,6-dimethyl-6-allyl cyclohexadienone (II), 2,6-dimethyl-4-allyl cyclohexadienone- $\Delta^2,5$  (III), and 2,6-dimethyl-4-allyl phenol (IV). Accordingly, I was rearranged in the presence of maleic anhydride, in the hope that some II might be trapped as a Diels-Alder adduct. Two isomeric adducts (V and VII) were indeed obtained in 9.82% yield. V was soluble in alkali, insoluble in water, and decolorized potassium permanganate rapidly. Infrared: 5.42, 5.62 $\mu$  (cyclic five-membered anhydride), 5.82 (cyclic six-membered ketone), 6.13 (terminal methylene group). Ultraviolet:  $e_{303} = 64$ ; no high-intensity maxima. V took up exactly two molar equivalents of hydrogen to yield the tetrahydro derivative

VI, which was saturated to permanganate. Infrared: Same as that of V in the carbonyl region; the band at 6.13 $\mu$  disappeared.

No adduct was obtained when maleic anhydride was heated with rearranged phenol IV under identical reaction conditions. To show that I contained no II before pyrolysis, part of the same sample from which V and VII had been obtained was heated with maleic anhydride at 100° for three hours. No adduct was obtained. But when this was repeated using I which had previously been heated briefly at 200°, a trace of V was obtained.

To show that the II which yielded V and VII was an actual intermediate and not the product of a side reaction, pure V was pyrolyzed at 200°. From this, IV was isolated as the phenylurethan.

The structure of the adducts was proved by synthesizing VI. High pressure hydrogenation of 2,6-dimethyl phenol yielded 2,6-dimethyl cyclohexanol, which was oxidized to 2,6-dimethyl cyclohexanone with chromic acid. This was alkylated with allyl bromide, using sodium hydride, to produce 2,6-dimethyl-2-allyl cyclohexanone, which was hydrogenated to 2,6-dimethyl-2-propyl cyclohexanone (DNP ultraviolet: 369  $\mu$ ). This was chlorinated with sulfonyl chloride and dehydrohalogenated with collidine to yield 2,6-dimethyl-6-propyl-2-cyclohexene-1-one (ultraviolet: 237  $\mu$ ). The same 2,4-dinitrophenylhydrazone was obtained from this as from the chloroketone (ultraviolet: 386  $\mu$ ). Bromination with N-bromosuccinimide produced 2,6-dimethyl-6-propyl-4-bromo-2-cyclohexene-1-one (ultraviolet: 237  $\mu$ ), and dehydrohalogenation with collidine yielded what was apparently a mixture of 2,6-dimethyl-6-propyl cyclohexadienone (ultraviolet: 312  $\mu$ ) and 2-methylidene-6-methyl-6-propyl- $\Delta^3$ -cyclohexenone (ultraviolet: 239  $\mu$ ). The same 2,4-dinitrophenylhydrazone (ultraviolet: 407  $\mu$ ) was obtained from the dienone as from the bromoketone. Treatment of the dienones with maleic anhydride yielded 62% of an adduct, which could only have been formed from the homoannular dienone. Upon hydrogenation of this adduct, VI was obtained, proved by the identity of melting points, mixed melting point and infrared spectra.

Although the reaction II  $\rightarrow$  III is irreversible because III is tautomeric with a phenol (IV), the corresponding reaction ought to be reversible when a methyl group occupies the para-position. Pyrolysis of mesityl allyl ether in the presence of maleic anhydride would therefore be expected to produce a Diels-Alder adduct like V in high yield. Accordingly, mesityl allyl ether was prepared from mesitylene by the following sequence of reactions: nitration, catalytic reduction, diazotization, hydrolysis, and alkylation with allyl bromide. Dienones were removed by lithium aluminum hydride treatment, and heating with maleic anhydride yielded 64% of an adduct like V, characterized as a crystalline dihydro compound.

Thus, the reaction sequence I  $\rightarrow$  II  $\rightarrow$  (III)  $\rightarrow$  IV has been proved.

58 pages. \$1.50. Mic 56-2104

## REACTIONS OF FLUORINATED FUNCTIONS AND SYNTHESIS OF FLUORINATED PARAFFINS

(Publication No. 17,388)

**Richard Henry Groth, Ph.D.  
The Ohio State University, 1956**

Aldehydes and ketones having electron withdrawing groups in their alpha position react with diazomethane to form the corresponding ethylene oxides. This tendency is again manifested in the reactions of  $\text{CF}_3\text{CHO}$  and  $\text{CF}_3\text{COCH}_3$  with diazomethane. These fluorinated oxides, on hydrogenolysis with Raney Nickel, form the secondary and tertiary alcohols respectively.

The failure of diazomethane to react with  $\text{CF}_3\text{CH}_2\text{CF}_3$  indicates that the acidity of its hydrogen atoms is less than that of the hydrogen atoms in cyanuric acid or in trimethylene trisulfone.

The McFadyen-Stevens aldehyde synthesis has been shown to be unsatisfactory in the case of



instead of obtaining  $\text{CF}_3\text{CHO}$ ,  $\text{CF}_3\text{H}$  and CO were identified as the reaction products. The same result was obtained with or without base.  $\text{CF}_3\text{CONHNHCOCF}_3$ , on pyrolysis, also gave  $\text{CF}_3\text{H}$  and CO as products.

The hydrogenolysis of  $C_3F_7NHCOOCH_2C_6H_5$  gave no  $C_3F_7NH_2$ , but only  $C_2F_5CONH_2$ , toluene, and HF. This result supports the belief that the amine is not inherently unstable but is formed, loses HF, and is hydrolyzed. This benzyl urethane is unstable to heat and standing, in contrast with  $C_3F_7NHCOOCH_3$ . The methyl urethane was not broken down by hydrogenation under the conditions found satisfactory for the benzyl urethane.

The reaction of  $(CF_3CO)_2O$  with  $LiAlH_4$  gave a mixture of acid, aldehyde, alcohol, and ester as products; with Grignard reagents, viz.,  $CH_3MgBr$ , i- $C_3H_7MgBr$  and  $C_4H_9MgBr$ , acid, ester, and alcohol (tertiary in the first case, otherwise secondary) were formed.  $(C_3F_7CO)_2O$  gave similar results on reacting with  $CH_3MgBr$ .

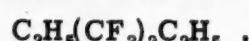
Perfluorinated acids with Grignard reagents produced ketones as the main product and, in addition, some alcohol (tertiary alcohol from  $\text{CH}_3\text{MgBr}$ , secondary from all others except t- $\text{C}_4\text{H}_9\text{MgCl}$ , which gave a primary alcohol).  $\text{CF}_3\text{COOH}$  was reacted with  $\text{CH}_3\text{MgBr}$  and  $\text{C}_4\text{H}_9\text{MgBr}$ ;  $\text{C}_3\text{F}_7\text{COOH}$ , with  $\text{C}_3\text{H}_7\text{MgBr}$ , i- $\text{C}_4\text{H}_9\text{MgBr}$ , and t- $\text{C}_4\text{H}_9\text{MgCl}$ . The yield of product was good in the case of primary Grignard reagents, only fair in the case of secondary Grignard, and very poor with the tertiary Grignard. Di-basic perfluorinated acids reacted similarly; perfluoro-succinic and glutaric acids were reacted with  $\text{CH}_3\text{MgBr}$ .

Synthesis of paraffins having clusters of fluorine atoms at one end, at both ends, or in the middle were devised.  $C_3F_7C_3H_7$ ,  $C_3F_7CH_2CH(CH_3)_2$ ,  $C_2H_5C_2F_4C_2H_5$ , and  $CF_3C_4H_9CF_3$  were synthesized as follows:

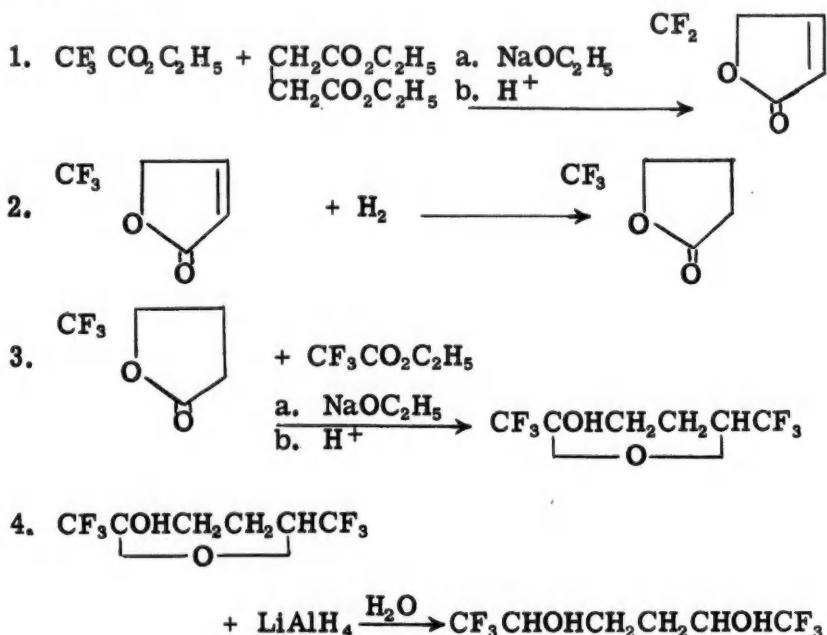
C<sub>3</sub>F<sub>7</sub>C<sub>3</sub>H<sub>7</sub> was prepared by dehydration of the alcohol, C<sub>2</sub>F<sub>5</sub>CHOHC<sub>2</sub>H<sub>5</sub>, with P<sub>2</sub>O<sub>5</sub>, followed by hydrogenation.

$C_3F_7CH_2CH(CH_3)_2$  was prepared by a similar sequence.

$C_2H_5C_2F_4C_2H_5$  was prepared from the diketone,  $CH_3CO(CF_2)_2COCH_3$ , by reduction with  $LiAlH_4$  to a diol,  $CH_3CHOH(CF_2)_2CHOHCH_3$ , pyrolysis of the diol diacetate to a diene, and hydrogenation of the diene to



$$\text{CF}_3\text{C}_4\text{H}_3\text{CF}_3$$



This diol was converted to the diacetate, pyrolyzed, and the resulting diene hydrogenated.

Attempts to reduce fluorinated ketones by Clemmensen and Wolff Kishner procedures were unsuccessful in the following cases that were tried:  $\text{CF}_3\text{COCH}_3$ ,  $\text{C}_4\text{H}_9\text{COCH}_3$ , and  $\text{CH}_3\text{CO}(\text{CF}_2)_2\text{COCH}_3$ , by Clemmensen, and  $\text{CF}_3\text{COCH}_3$  and  $\text{C}_6\text{F}_5\text{COCH}_3$  (as semicarbazones), by Wolff Kishner.

126 pages. \$1.70. Mic 56-2105

## THE SYNTHESIS OF QUERCETIN-2-C<sup>14</sup>

(Publication No. 16.975)

Mark Elias Gutzke, Ph.D.  
The University of Oklahoma. 1956

Supervisor: Dr. Simon H. Wender

Radioactive tracer techniques have become a very important tool in studying the fate of metabolites in biological systems. The use of this technique to aid in elucidating the fate of flavonoids in biological systems has been undertaken by S. H. Wender and co-workers.

In connection with these radioactive studies, the first synthesis of a specifically labeled, polyhydroxy flavonoid compound has been accomplished. The flavonoid prepared was quercetin-2-C<sup>14</sup>.

Preliminary investigations on the total synthesis of quercetin were carried out, and from the reactions studied, those which proved to be the most feasible were used in the labeled syntheses. The starting material was potassium cyanide-C<sup>14</sup>. This was carried through the following reactions:

- following reactions.

  1. Potassium cyanide-C<sup>14</sup> was converted into cuprous cyanide-C<sup>14</sup>.
  2. The cuprous cyanide-C<sup>14</sup> was reacted with 4-iodo-veratrole to obtain veratronitrile-C<sup>14</sup>N.
  3. Veratronitrile-C<sup>14</sup>N was hydrolyzed to veratic acid-C<sup>14</sup>OOH.

In order to show the position of the labeled carbon atom, a small sample of the veratric acid- $\text{C}^{14}\text{OOH}$  was

decarboxylated. All the radioactivity was found in the liberated carbon dioxide-C<sup>14</sup>.

4. Veratric acid-C<sup>14</sup>OOH was converted, with thionyl chloride, into veratroyl chloride-C<sup>14</sup>OCl.

5. The veratroyl chloride-C<sup>14</sup>OCl was reduced, by the Rosenmund reaction, to verataldehyde-C<sup>14</sup>HO.

6. Verataldehyde-C<sup>14</sup>HO was condensed with 2,4-dimethylphloroacetophenone, in a basic solution, to produce the chalcone of 5,7,3',4'-tetramethyleriodictyol-2-C<sup>14</sup>.

7. A ring closure of the chalcone of 5,7,3',4'-tetramethyleriodictyol-2-C<sup>14</sup> was accomplished in an acidic solution and the flavanone, 5,7,3',4'-tetramethyleriodictyol-2-C<sup>14</sup>, was obtained.

8. The conversion of the 5,7,3',4'-tetramethyleriodictyol-2-C<sup>14</sup> into its 3-isonitroso derivative, with n-butyl nitrite, and the hydrolysis of this product, with hydrochloric acid, into 5,7,3',4'-tetramethylquercetin-2-C<sup>14</sup> were carried out in one step.

9. The demethylation of 5,7,3',4'-tetramethylquercetin-2-C<sup>14</sup> was carried out with hydriodic acid. Quercetin-2-C<sup>14</sup> was obtained after chromatographic purification of the demethylated product.

A small sample of the quercetin-2-C<sup>14</sup> was completely methylated with dimethyl sulfate. The resulting derivative checked with an unlabeled, authentic sample of 3,5,7,3',4'-pentamethylquercetin.

The pentamethylquercetin was degraded with ethanolic potassium hydroxide. Veratric acid-C<sup>14</sup>OOH was obtained as the radioactive fragment. This acid was decarboxylated and all the radioactivity was shown to be in the liberated carbon dioxide-C<sup>14</sup>. 68 pages. \$1.50. Mic 56-2106

**PART I: 14-ISOESTRONE METHYL ETHER.**

**PART II: SYNTHESIS OF DL-3 $\alpha$ , 11 $\beta$ -DIHYDROXY-D-HOMO-18-NORETIOCHOLAN-17a-ONE.**

**PART III: APPROACHES TO THE SYNTHESIS OF ALDOSTERONE.**

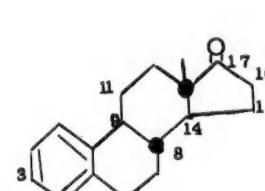
(Publication No. 16,173)

William Francis Johns, Ph.D.  
The University of Wisconsin, 1955

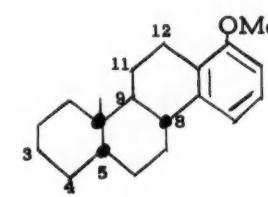
Supervisor: Professor William S. Johnson

**PART I.--** To establish unequivocally the structure of the compound designated as dl-14-isoestrone (I: 3-OH, 14 $\beta$ -H) produced in two estrone syntheses (G. Anner and K. Miescher, *Helv. Chim. Acta*, **31**, 2173 (1948) and W. S. Johnson and R. G. Christiansen, *J. Am. Chem. Soc.*, **73**, 5511 (1951)), d-14-isoestrone methyl ether was synthesized starting with d-estrone methyl ether (I: 3-OMe). The enol acetate of estrone methyl was brominated to yield largely a single bromo ketone (I: 3-OMe; 16-Br). The C<sub>17</sub>-ethylenedioxy ketal was dehydrobrominated with potassium t-butoxide, providing the  $\Delta^{15}$ -unsaturated ketal (overall yield: 33%). Acid treatment gave  $\Delta^{15}$ -equilin methyl ether (I: 3-OMe;  $\Delta^{15}$ ),  $\Delta^{14}$ -equilin methyl ether and  $\Delta^{15}$ -14-isoequilin methyl ether, or  $\Delta^8$ -14-isoequilin methyl ether, depending on the severity of the conditions used. Catalytic reduction of the first compound gave estrone methyl ether; hydrogenation of either the second or

third of these compounds gave 14-isoestrone methyl ether in high yield, identical in the infrared with the racemic material. This proved the structure of the totally synthetic product.



I

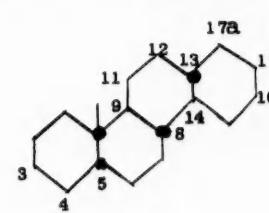


II

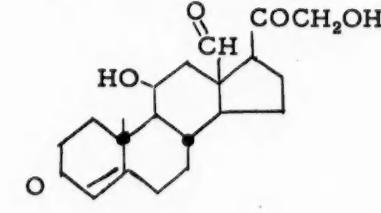
**PART II.--** Total synthesis of steroids possessing both a C<sub>11</sub>-oxygen function and the 3-keto- $\Delta^4$  system from the readily available 17a-methoxy-4,8-bisdehydrochrystene (II: 3=O;  $\Delta^4$ ;  $\Delta^8$ ) would conveniently use dl-3 $\alpha$ ,11 $\beta$ -dihydroxy-D-homo-18-noretiocholan-17a-one (III: 3 $\alpha$ -OH; 11 $\beta$ -OH; 17a=O) as an intermediate. Catalytic reduction of the  $\Delta^4$ -bond in the starting material followed by hydride reduction of the C<sub>3</sub>-ketone and potassium-ammonia reduction of the styrene bond ( $\Delta^8$ ) afforded the tetrahydro alcohol (II: 3 $\alpha$ -OH) in 62% overall yield. Acetoxylation of C<sub>12</sub> by lead tetraacetate (cf. W. S. Johnson, A. D. Kemp, and R. Pappo, *J. Am. Chem. Soc.*, **76**, 3353 (1954)) followed by dehydroacetoxylation gave the styrene acetate (II: 3 $\alpha$ -OH,  $\Delta^{11}$ ). Oxidation with perbenzoic acid and lithium-ammonia reduction afforded the C<sub>11</sub> $\beta$ -alcohol (II: 3 $\alpha$ -OH; 11 $\beta$ -OH). Vigorous lithium-ammonia reduction of this compound or of the crude peracid product followed by acid hydrolysis gave the unsaturated ketone (III: 3 $\alpha$ -OH; 11 $\beta$ -OH; 17=O,  $\Delta^{13}$ ) which was reduced catalytically to the desired compound (III: 3 $\alpha$ -OH; 11 $\beta$ -OH; 17=O in 11% overall yield.

Proof of configuration of this molecule entailed Oppenauer oxidation of the 3 $\alpha$ -hydroxyl group followed by direct bromination and dehydrobromination of the hydroxy diketone, yielding 13% of the  $\Delta^4$ -ketone (III: 3=O; 11 $\beta$ -OH; 17a=O;  $\Delta^4$ ) which was reduced with lithium-ammonia to give a triacetate (III: 3 $\beta$ -OAc; 11 $\beta$ -OAc; 17a $\beta$ -OAc). This triacetate was identical with one prepared by lithium-ammonia reduction and acetylation of the 5 $\alpha$ -isomer (III: 3 $\beta$ -OH; 11 $\beta$ -OH; 17a=O; 5 $\alpha$ -H), the configuration of which had been proved previously (cf. W. S. Johnson, A. D. Kemp, and R. Pappo, *loc. cit.*).

A two-stage catalytic reduction of 17a-methoxy-4,8-bisdehydrochrystene produced the *cis-syn-cis* ketone (II: 3=O; 9 $\beta$ -H) in 55% yield. Hydride reduction and esterification (62% yield for two steps) was followed by lead tetraacetate oxidation of C<sub>12</sub> and dehydroacetoxylation to give the styrene ester (II: 3 $\alpha$ -OR;  $\Delta^{11}$ ) in 35% yield.



III

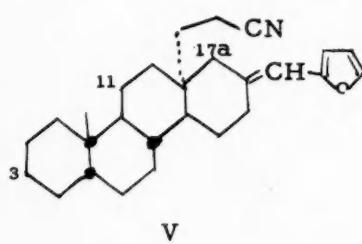


IV

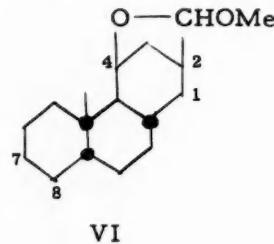
**PART III.--** Attempts to synthesize the newly discovered and highly potent adrenal hormone, aldosterone (IV), from 3 $\alpha$ ,11 $\beta$ -dihydroxy-D-homo-18-noretiocholan-17a-one

were initiated by treating its furfurylidene derivative with acrylonitrile, affording a Michael adduct (V:  $3\alpha$ -OH;  $11\beta$ -OH;  $17\alpha$ =O). Reduction of the  $C_{17\alpha}$ -carbonyl with sodium borohydride followed by *i*-propenyl acetate acetylation, or sodium borohydride reduction of the diacetate (V:  $3\alpha$ -OAc;  $11\beta$ -OAc;  $17\alpha$ =O) followed by pyridine-acetic anhydride acetylation gave only a small yield of the triacetate (V:  $3\alpha$ -OAc;  $11\beta$ -OAc;  $17\alpha$ -OAc). The  $3,17\alpha$ -diacetate was amorphous. Ozonization of the tryhydroxy derivative, the  $3,17\alpha$ -diacetate, and the triacetate were tried, but only the last yielded a crystalline derivative (in 20% yield).

Direct sodium borohydride reduction of the ozonized Michael adduct gave a tetrol (III:  $3\alpha$ -OH;  $11\beta$ -OH;  $17$ -OH;  $17\alpha$ -OH;  $13\alpha$ -CH<sub>2</sub>CH<sub>2</sub>CN) which could be cleaved with sodium metaperiodate, treated with methanolic acid, and acetylated to give the crystalline acetal lactol ether (VI:  $1\beta$ -CH<sub>2</sub>CH<sub>2</sub>CH(OMe)<sub>2</sub>;  $2\alpha$ -CH<sub>2</sub>CH<sub>2</sub>CN;  $7\alpha$ -OAc) in 60% overall yield. Phenyl lithium treatment of the corresponding  $2\alpha$ -CH<sub>2</sub>CH<sub>2</sub>CO<sub>2</sub>Me derivative was followed by selective acetylation of the  $3$ -hydroxyl and thionyl chloride dehydration to yield the diphenyl ethylene (VI:  $1\beta$ -CH<sub>2</sub>CH<sub>2</sub>CH(OMe)<sub>2</sub>;  $2\alpha$ -CH<sub>2</sub>CH=CHCO<sub>2</sub>;  $7\alpha$ -OAc) but attempts to selectively hydrolyze the acetal group of this molecule were accompanied by side reactions. Selective hydrolysis of the nitrile acetal went smoothly in 70% aqueous acetic acid to give the mono-aldehyde (VI:  $1\beta$ -CH<sub>2</sub>CH<sub>2</sub>CHO;  $2\alpha$ -CH<sub>2</sub>CH<sub>2</sub>CN;  $7\alpha$ -OAc). Formation and ozonolysis of its enamine derivative followed by acetal formation gave 35% of the nor-acetal (VI:  $1\beta$ -CH<sub>2</sub>CH(OMe)<sub>2</sub>;  $2\alpha$ -CH<sub>2</sub>CH<sub>2</sub>CN;  $7\alpha$ -OAc). Phenyl lithium treatment of the corresponding  $2\alpha$ -CH<sub>2</sub>CH<sub>2</sub>CO<sub>2</sub>Me derivative followed by acetylation and thionyl chloride dehydration gave a phenyl styrene which on ozonolysis gave a fair yield of the aldehyde (VI:  $1\beta$ -CH<sub>2</sub>CH(OMe)<sub>2</sub>;  $2\alpha$ -CH<sub>2</sub>CHO;  $7\alpha$ -OAc). Aqueous acetic acid afforded a trialdehyde which was cyclized, reduced catalytically, and oxidized, but none of these products could be obtained crystalline.



245 pages. \$3.06. Mic 56-2107



#### PREPARATION AND REACTIONS OF PERFLUOROALKYLLITHIUMS (PARTS I AND II)

(Publication No. 15,613)

Gerard Forsyth Judd, Ph.D.  
Purdue University, 1953

Major Professors: O. R. Pierce and E. T. McBee

The conditions of formation of heptafluoropropyl-lithium and trifluoromethyl lithium by interchange with

butyl- or methylolithium have been studied and an overall yield of the lithium reagent of 99% was obtained as shown by hydrolysis to heptafluoropropane. Thermal decomposition of the reagent with carbonyl compounds having an active hydrogen led to aldol-type products as well as the expected addition product, the best yield occurring with propionaldehyde (94%) and the lowest, benzophenone (0%). The scope and limitations of the reactions are discussed.

#### Preparation of Fluoro-organo Phosphorus Compounds

Major Professors: E. T. McBee, W. E. Truce, and  
O. R. Pierce

The attempted preparation of a diethyl trifluoromethane phosphonate by the reaction of iodotrifluoromethane with sodium diethyl phosphite produced trifluoromethane and ethyl phosphate in an anomalous reaction. The pK<sub>a</sub> of diethyl phosphite was determined to be less than 11. Tris-2,2,2-trifluoroethyl phosphate was found to hydrolyze approximately fifty times as rapidly as ethyl phosphate.

109 pages. \$1.36. Mic 56-2108

#### A STUDY OF CERTAIN CONJUGATED DIENES:

- I. 4-NEOPENTYL-1,2-DIMETHYLENECYCLOHEXANE
- II. METHYL SUBSTITUTED ISOPRENES

(Publication No. 15,025)

Robert Gene Laughlin, Ph.D.  
Cornell University, 1955

Part I. The objects of this work were the synthesis, proof of structure, and polymerization of 4-neopentyl-1,2-dimethylenecyclohexane (I). The problem was undertaken to study the importance, relative to other factors, of an all *cis* configuration in 1,4-polymers of conjugated 1,3-dienes. The diene (I) is one member of a family having a carbocyclic ring fused to a butadiene skeleton in the 2,3-positions. Polymerization (1,4-) places the resulting 2,3-double bond in a six-membered ring, and the resulting polymer must therefore possess an all *cis* configuration.

The diene (I) was synthesized from 2-neopentyl-1,3-butadiene, which on reaction with maleic anhydride gave 4-neopentyl-4-cyclohexene-1,2-dicarboxylic anhydride. Catalytic reduction, lithium aluminum hydride reduction, and acetylation gave 4-neopentyl-1,2-bis (acetoxymethyl) cyclohexane, which on pyrolysis at 525-550° gave I.

Evidence that the assigned structure was correct was provided by analysis, ozonolysis to formaldehyde, the infrared spectrum, formation of 1:1 adducts with maleic anhydride and sulfur dioxide, and an ultraviolet maximum at 221 m $\mu$ . Supporting evidence was provided by degradation of the maleic acid adduct to a  $\beta$ -alkyl naphthalene.

Emulsion polymerization of the diene I was very slow and gave a flaky polymer, which was essentially non-crystalline as shown by X-ray studies. Kinetic titration of the polymer with perbenzoic acid indicated that it comprised only 66% 1,4-polymer units.

Part II. Possible syntheses of a number of isoprene derivatives bearing a functional group on the methyl carbon were investigated, as a part of a monomer synthesis program.

Contrary to the earlier report of Petrov (1945), dehydrobromination of 1,4-dibromo-2-methyl-2-butene over solid potassium hydroxide gave a mixture containing principally vinyl bromides and about 12% 2-bromomethyl-1-, 3-butadiene. Dehydrochlorination of 1,4-dichloro-2-methyl-2-butene yielded similar results. 2-Chloromethyl-1,3-butadiene was obtained as a by-product of the reaction of isoprene with chlorine in ether solution.

High temperature allylic halogenation of isoprene with either chlorine or bromine proved to be impractical due to either oxidation, addition of the halogens to isoprene, or addition of hydrogen halides to isoprene.

2-Cyanomethyl-1,3-butadiene could be obtained by reaction of the chloro or bromo derivatives of isoprene (above) with acid-washed cuprous cyanide. 1-Cyano-2-methyl-1,3-butadiene could be obtained either by reaction of the halide with potassium cyanide and lithium chloride in acetonitrile, or by isomerization of 2-cyanomethyl-1,3-butadiene with the same reagent.

Peracid hydroxylation of isoprene followed by acetylation gave 1,2-diacetoxy-2-methyl-3-butene, which on pyrolysis at 400-500° gave a mixture of 2-acetoxymethyl-1,3-butadiene and 1-acetoxy-2-methyl-1,3-butadiene. Pyrolysis of 1,4-diacetoxy-2-methyl-2-butene gave the same mixture, and evidence was obtained that the 1,2- and 1,4-diacetate are readily interconvertible at pyrolysis temperatures. Saponification and fractionation of the product gave 2-hydroxymethyl-1,3-butadiene.

162 pages. \$2.03. Mic 56-2109

#### AN ISOTOPE EFFECT STUDY OF THE MECHANISM OF THE WOLFF REARRANGEMENT

(Publication No. 16,961)

Davis Bates Richardson, Ph.D.  
University of Arkansas, 1956

Major Professor: Arthur Fry

In general, if an atom in a molecule undergoes bond formation or bond rupture in the rate-determining step of a reaction, there will be a difference in rate between molecules with different isotopes at this position. This difference in the rate is known as the isotope effect.

Since bond rupture or bond formation involves two or more atoms, more information about the rate-determining step of a reaction may be gained by successively labelling each atomic position suspected of undergoing bond alteration in the rate-determining step and determining the isotope effect in the reaction. The interpretation of the data obtained should point out the rate-determining step of the reaction.

This principle of locating the rate-determining step of a reaction has been applied to the Wolff rearrangement. The particular example studied was the rearrangement of 1-(1-naphthyl)-3-diazo-2-propanone in hot aniline to form 3-(1-naphthyl)-propionanilide.

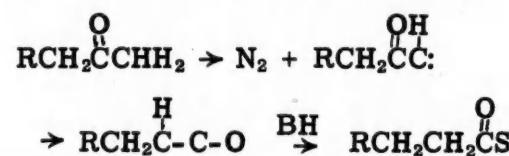
The desired carbon isotope effects were determined from the reaction of 1-(1-naphthyl)-3-diazo-2-propanone-1-C<sup>14</sup>, 1-(1-naphthyl)-3-diazo-2-propanone-2-C<sup>14</sup>, and 1-(1-naphthyl)-3-diazo-2-propanone-3-C<sup>14</sup>. These compounds were prepared by usual radioactive labelling procedures.

The nitrogen isotope effect has been found from the reaction of 1-(1-naphthyl)-3-diazo-2-propanone of normal isotopic composition.

The reaction was carried out in a constant pressure apparatus and the fraction of reaction was determined from the volume of nitrogen evolved. The isotope effect was calculated from the fraction of reaction and the molar activities or the N<sup>15</sup> mole fractions of reactant and product.

In the reaction of 1-(1-naphthyl)-3-diazo-2-propanone-1-C<sup>14</sup> a 1.5% isotope effect was found, no isotope effect was found in the reaction of 1-(1-naphthyl)-3-diazo-2-propanone-2-C<sup>14</sup>, and an 8.0% isotope effect was found in the reaction of 1-(1-naphthyl)-3-diazo-2-propanone-3-C<sup>14</sup>.

A nitrogen isotope effect of 1.7% was found in the reaction of 1-(1-naphthyl)-3-diazo-2-propanone. These results have been interpreted on the basis of the currently accepted mechanism of the Wolff rearrangement.

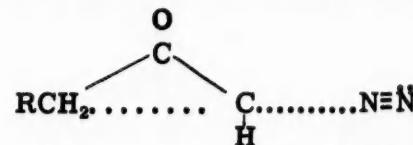


This mechanism indicates that the diazoketone loses nitrogen to form an "open sextet" intermediate. This intermediate then rearranges in a later step. There is also the possibility that the loss of nitrogen and the rearrangement occur simultaneously. On the basis of previous knowledge it was not possible to distinguish between these possibilities. Interpretation of the results found in this study gives information concerning these possibilities and also information about the rate-determining step of the reaction.

The isotope effect found in the reaction of 1-(1-naphthyl)-3-diazo-2-propanone-3-C<sup>14</sup> and the nitrogen isotope effect found in the reaction of the sample of normal isotopic composition show that the carbon-nitrogen bond breaks in the rate-determining step of the reaction.

The isotope effect found in the reaction of 1-(1-naphthyl)-3-diazo-2-propanone-1-C<sup>14</sup> shows that the methylene carbon is undergoing bond change in the rate-determining step and thus migration must occur simultaneously with loss of nitrogen. The fact that no isotope effect was found in the reaction of 1-(1-naphthyl)-3-diazo-2-propanone-2-C<sup>14</sup> shows that the carbonyl carbon bonding is essentially unchanged in the transition state of the rate-determining step.

From these conclusions it is possible to get a fairly clear picture of the transition state in the Wolff rearrangement. The nitrogen molecule is breaking away and the new carbon-carbon bond has started to form.



61 pages. \$1.50. Mic 56-2110

THE REACTION OF BICYCLO[2,2,2]OCTEN-2-OL-1  
WITH HYDROBROMIC ACID

(Publication No. 17,098)

Anne Burchsted Sayigh, Ph.D.  
Columbia University, 1954

In connection with the study of the reactivity of bridgehead substituents in bicyclic compounds, the synthesis of bicyclo[2,2,2]octen-2-ol-1 (III) has been accomplished by the oxidative bisdecarboxylation of 1-acetoxybicyclo-[2,2,2]octane-2,3-dicarboxylic anhydride (XXXVIIa), which had been separated by fractional crystallization of the hydrogenated product mixture from the reaction of 1-acetoxy- $\Delta^1,3$ -cyclohexadiene (XXXVIa) and 2-acetoxy- $\Delta^1,3$ -cyclohexadiene (XXXVIb) with maleic anhydride.

III has been treated at room temperature with 48.5% hydrobromic acid, giving a mixture of bromhydrins which were reduced with Raney nickel to a mixture of two alcohols. The alcohols on treatment with zinc bromide and hydrobromic acid gave bromides, which on reduction afforded hydrocarbon having an infrared spectrum almost the same as bicyclo[3,2,1]octane (XVIII).

The solvolysis of the bromides in 70% dioxane-water was studied at 131° to obtain qualitative information about the composition of the mixture. The first-order rate constant obtained decreased with time and the curve was separated into its straight-line components. There were found to be three: the first, that of 1-bromobicyclo[3,2,1]-octane ( $6.5 \pm 0.7 \times 10^{-3}$  hr.<sup>-1</sup>), present to the extent of 46%; the second, that of 1-bromobicyclo[2,2,2]octane ( $3.6 \pm 0.4 \times 10^{-2}$  hr.<sup>-1</sup>), which was present as 28% of the mixture; and the third, that of a component comprising 26% of the mixture whose rate was too fast to measure by the method used. Treatment of the mixed bromides with aqueous silver nitrate resulted in the isolation of the starting mixture of alcohols plus an olefin, evidence that the third component was formed in the reaction with zinc bromide and hydrobromic acid. Therefore, the alcohol mixture from the reduction of the bromhydrins contained the two alcohols, the previously unknown bicyclo[3,2,1]-octanol-1 (V) and bicyclo[2,2,2]octanol-1 (XXXIII). These have been separated by crystallization of their phenylazobenzoate derivatives, the bicyclo[2,2,2]octyl derivative being isolated in about 20% yield and the bicyclo[3,2,1]-octyl derivative in about 55% yield.

Energy and entropy factors which may influence the rearrangement of the bicyclo[2,2,2]octyl system to the bicyclo[3,2,1]octyl system were discussed. The effect which these factors would have on the solvolysis rates was also discussed. 61 pages. \$1.50. Mic 56-2111

THE TOTAL SYNTHESIS OF DEHYDROABIETIC ACID

(Publication No. 17,080)

John W. Schulenberg, Ph.D.  
Columbia University, 1956

Dehydroabietic acid, a naturally occurring diterpene, was totally, stereospecifically synthesized from 2-acetonaphthone in eighteen steps. The overall yield was about 0.4%. This was the first stereospecific synthesis of a tri-

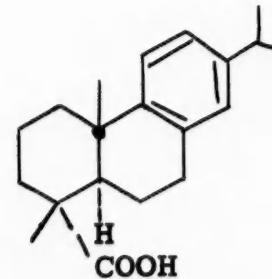
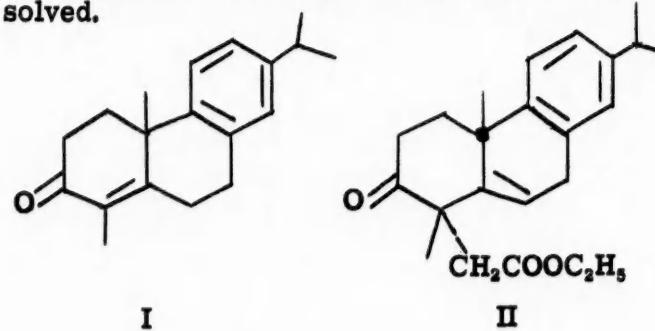
cyclic diterpene. The identity of the racemic product with that of the natural acid was proved by the superimposability of their infrared spectra.

2-Acetonaphthone was converted into 2-isopropyl-naphthalene by treatment with methylmagnesium iodide, dehydration of the product, and subsequent hydrogenation. Next, sulfonation and potassium hydroxide fusion of the product gave 6-isopropyl-2-naphthol. The structure of this was proven by the identity of its methyl ether, by infrared comparison, with authentic ether prepared by the following route. 6-Methoxy-2-acetonaphthone was treated with ethyl chloroacetate and base, the resulting glycidic ester then being saponified. Decarboxylation and rearrangement yielded the expected aldehyde, which was converted into 2-methoxy-6-isopropynaphthalene by the Wolff-Kishner reduction.

The naphthol was then converted into 6-isopropyl-2-tetralone by Birch reduction. This was treated with pyrrolidine and the resulting eneamine alkylated with methyl iodide to give 1-methyl-6-isopropyl-2-tetralone. The third ring was added by treatment with either ethyl vinyl ketone or the methiodide of its corresponding Mannich base, the resulting ketone (I) then being reacted with ethyl bromoacetate and base. The infrared spectrum of the product (II) proved that alkylation had occurred alpha to the carbonyl. The stereochemistry shown was expected because of hindrance of the angular methyl group to any group attempting to enter on the same side of the molecule.

The ketonic carbonyl was then removed by conversion of II into its ethylenedithioketal, saponification, purification of the resulting acid, reesterification of the crystalline acid and Raney nickel desulfurization. Hydrogenation then gave racemic homodehydroabietic acid, as the only isomer obtained. The anticipated constitution and configuration of this acid were proved by the identity of its infrared spectrum with that of authentic homodehydroabietic acid, prepared by Arndt-Eistert homologation of the natural product.

Barbier-Wieland degradation of the synthetic acid, the last step being oxidation with chromium trioxide, then gave racemic dehydroabietic acid (III). Both this and its methyl ester had infrared spectra identical to those of the corresponding natural products. The acid was not resolved.



III        115 pages. \$1.50. Mic 56-2112

THE REACTION OF  $\alpha$ -CHLOROCYCLOHEXANONES  
WITH THE GRIGNARD REAGENT

(Publication No. 16,695)

Joseph Weber, Ph.D.  
Rutgers University, 1956

The reaction of an  $\alpha$ -chloroketone with a Grignard reagent produces the expected chlorohydrin when carried out under mild conditions. At higher temperatures a rearranged ketone is produced. This reaction has been extended to include  $\alpha$ -chlorocyclohexanones and can be used as a method for preparing 2-phenylcyclohexanone from 2-chlorocyclohexanone and phenyl Grignard. One discrepancy in the literature is the reaction by Newman and Booth<sup>1</sup> of phenyl Grignard with 2-chloro-4-methylcyclohexanone to give 2-phenyl-4-methylcyclohexanone and 2-phenyl-5-methylcyclohexanone. The products were not identified directly but were degraded to known compounds. More recent evidence has shown that ring-contraction may occur when  $\alpha$ -chlorocyclohexanones are used and, in view of this evidence, it was difficult to understand the absence of ring-contraction and the presence of 2-phenyl-5-methylcyclohexanone in the reaction product of Newman and Booth.

The purpose of this thesis was to reinvestigate the work of Newman and Booth in order to examine the reaction product directly for the presence of two isomers. A second purpose was to develop a general reaction path by varying the  $\alpha$ -chloroketones and the Grignard reagents.

The work of Newman and Booth was repeated in its entirety five times and it was not possible to identify any 2-phenyl-5-methylcyclohexanone or any ring-contracted isomer. The degradation reactions yielded only m-phenylbenzoic acid, which is the end product from 2-phenyl-4-methylcyclohexanone.

The other reactions studied and the results obtained were as follows:

(1)  $\alpha$ -Chlorocyclohexane was treated with methylmagnesium iodide to give a shifted isomer, 2-methylcyclohexanone, in 54.6% yield and a ring-contracted isomer, acetyl cyclopentane, in 45.4% yield.

(2)  $\alpha$ -Chlorocyclohexanone was treated with isopropylmagnesium bromide to give a shifted isomer, 2-isopropylcyclohexanone, in 81.1% yield and a ring-contracted isomer, isopropylcyclopentyl ketone, in 18.9% yield.

(3)  $\alpha$ -Chlorocyclohexanone was treated with o-methoxyphenylmagnesium bromide to give only the ring-contracted isomer, o-methoxyphenylcyclopentyl ketone.

(4) 2-Chloro-4-methylcyclohexanone was treated with isopropylmagnesium bromide to give a shifted isomer, 2-isopropyl-4-methylcyclohexanone, in 88.2% yield and a ring-contracted isomer, 3-methylcyclopentyl isopropyl ketone, in 11.8% yield.

(5) 2-Chloro-4,4-dimethylcyclohexanone was treated with phenylmagnesium bromide to give only the ring-contracted isomer, 3,3-dimethylcyclopentyl phenyl ketone.

The results obtained in all these experiments were explained on the basis of several factors. It was first necessary to know the stereochemistry of the  $\alpha$ -chlorine atom in the cyclohexanones. This chlorine atom was assigned axial or equatorial conformation by examination of the shift produced in the carbonyl frequency of the infra-

red spectrum. An equatorial chlorine atom produced a greater shift of the carbonyl frequency than did an axial chlorine atom. A second factor to be considered was the stereochemistry of the intermediate halomagnesium salt of the chlorohydrin. This intermediate was assigned a cis-chlorohydrin configuration for the following reasons: (a) One reaction of this type was shown to give a cis-chlorohydrin by rate studies of dehydrohalogenation, (b) the magnesium atom was closer to the  $\alpha$ -chlorine atom and it was possible to visualize a cyclic intramolecular process with displacement of the  $\alpha$ -chlorine atom and (c) cis-configuration gives the necessary coplanarity for both shift and ring-contraction. A third factor was the probability of interconversion and equilibration of two cis-chlorohydrin conformations, one with an axial  $\alpha$ -chlorine and the other with an equatorial  $\alpha$ -chlorine atom. A fourth factor was the migratory aptitude of the various Grignard reagents and a fifth factor was the steric effects of substituents on the cyclohexanones and the Grignard reagents.

The suggested mechanism was one in which the Grignard reagent added to give a cis-halomagnesium complex. This complex underwent ring-contraction, 1,2-shift or a mixture of both. The final product or products depended upon the migratory aptitude of the Grignard reagent and the steric factors present in the reactants.

92 pages. \$1.15. Mic 56-2113

1. M. S. Newman and W. T. Booth, J. Org. Chem., 12, 737 (1947).

CHEMISTRY, PHYSICAL

THE KINETICS OF THE PERMANGANATE-OXALIC ACID REACTION

(Publication No. 17,090)

Seymour Jacob Adler, Ph.D.  
Columbia University, 1954

A comprehensive investigation of the kinetics of the permanganate-oxalic acid reaction has been carried out by using both titrimetric and spectrophotometric techniques.

The mechanism proposed by Malcolm and Noyes (1) has been elucidated in detail. In addition, it has been shown that at very low oxalate concentrations  $MnO_4^-$  is reduced by some species in addition to Mn(II) and  $C_2O_4^{2-}$ . It is proposed that this species is  $Mn(C_2O_4)^+$ .

Specific rate constants for the decomposition of the di- and tri-oxalate complexes of Mn(III) have been determined; it has been confirmed that  $Mn(C_2O_4)^+$  — a mono-oxalate complex of Mn(III) — is kinetically important in certain solutions. Good agreement with the data of Taube (2) has been obtained.

It has been shown in quantitative detail that in certain solutions an induced oxidation of oxalate by oxygen is possible; in the process,  $H_2O_2$  is formed. A mechanism has been proposed which is in general agreement with that of Launer (3).

In connection with the present investigation, a technique has been developed whereby it was possible to obtain

molar extinction coefficients of the kinetically unstable di- and tri-oxalate complexes of Mn(III). Ultra-violet spectra of these complexes are presented; and the constant for the equilibrium between these complexes has been measured.

A titrimetric technique has been developed whereby the oxidizing action of hydrogen peroxide has been distinguished from that of Mn(III).

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1. J. M. Malcolm and R. M. Noyes: *J. Am. Chem. Soc.* 74, 2769-2775 (1952).
2. H. Taube: *J. Am. Chem. Soc.* 70, 1216-1220 (1948).
3. H. F. Launer: *J. Am. Chem. Soc.* 55, 865-874 (1933). 136 pages. \$1.80. Mic 56-2114

#### THE RADIATION CHEMISTRY OF AQUEOUS SOLUTIONS OF FERROUS ION AND ASCORBIC ACID

(Publication No. 17,092)

Nathaniel Frank Barr, Ph.D.  
Columbia University, 1954

The intensity distribution within two  $\text{Co}^{60}$  cylinders is reported in terms of the rate of oxidation of ferrous ion.

The effect of water purity on the rate of irradiation-induced oxidation of ferrous ion in 0.8 N sulphuric acid is examined. There was no detectable difference between ordinary distilled water and water subjected to various purification procedures. Pre-irradiation of irradiation vessels with doses of approximately one million roentgens was required in order to obtain reproducible results. The effect of sodium chloride on the rate of irradiation-induced oxidation and spontaneous oxidation of ferrous ion was studied also. The temperature dependence of the apparent extinction coefficient of ferric ion in 0.8 N sulphuric acid was found to be 0.5% per degree in the region of  $25^{\circ}\text{C}$ .

The ratio of the rates of irradiation-induced oxidation of ferrous ion in the presence and absence of oxygen was determined to be  $1.88 \pm 0.04$ . The ratio of the rates of oxidation of ferrous ion to the consumption of molecular oxygen was found to be  $4.15 \pm 0.1$ . These results are interpreted in terms of a mechanism for the irradiation-induced oxidation of ferrous ion.

The rates of irradiation-induced oxidation of ascorbic acid in 0.8 N sulphuric acid stabilized with oxalic acid were measured by titration with 2,6-dichlorophenolindophenol. The oxygen consumption during the irradiation-induced oxidation was compared with the results obtained for the oxidation of ferrous ion. A mechanism for the irradiation-induced oxidation, consistent with the data, is suggested.

72 pages. \$1.50. Mic 56-2115

#### KINETICS OF THE THALLIUM(I) - THALLIUM(III) EXCHANGE REACTION IN THE PRESENCE OF BROMIDE

(Publication No. 17,044)

Lee Graydon Carpenter, Ph.D.  
Columbia University, 1956

The kinetics of the  $\text{Tl}^{\text{I}} - \text{Tl}^{\text{III}}$  exchange in 0.5f  $\text{HClO}_4$  solutions containing bromide were studied at  $20^{\circ}\text{C}$ ,  $30^{\circ}\text{C}$ , and  $40^{\circ}\text{C}$ . over a bromide range of 0.0f to 0.5f. The results are interpreted in terms of reactions of bromide complexes of  $\text{Tl}^{\text{I}}$  and  $\text{Tl}^{\text{III}}$  and the over-all rate of exchange expressed as

$$\begin{aligned} R = & k_0(\text{Tl}^+)(\text{Tl}^{3+}) + k_2(\text{TlBr}_2^+) \\ & + k_3(\text{TlBr}_3^-) + k_4(\text{TlBr}_2^-)(\text{TlBr}_4^-). \end{aligned}$$

In solutions of 0.5f ionic strength and 0.5f acidity,

$$\begin{aligned} k_0 &= 1.2 \times 10^{-4} \text{ litre mole}^{-1} \text{ sec.}^{-1}, \\ k_2 &= 6.2 \times 10^{-7} \text{ sec.}^{-1}, \\ k_3 &= 2.7 \times 10^{-7} \text{ sec.}^{-1} \text{ and} \\ k_4 &= 7.4 \times 10^{-1} \text{ litre mole}^{-1} \text{ sec.}^{-1} \text{ at } 25^{\circ}\text{C}. \end{aligned}$$

From a study of the solubility of  $\text{TlBr}$  in solutions of  $\text{NaBr}$  at  $20^{\circ}\text{C}$ ,  $30^{\circ}\text{C}$ . and  $40^{\circ}\text{C}$ . the equilibrium constants for the formation of  $\text{TlBr}$  and  $\text{TlBr}_2^-$  were determined. At  $25^{\circ}\text{C}$ .  $(\text{TlBr})/(\text{Tl}^+)(\text{Br}^-) = 8.48$  and  $(\text{TlBr}_2^-)/(\text{TlBr})(\text{Br}^-) = 0.878$ . 71 pages. \$1.50. Mic 56-2116

#### DIFFUSION OF ORGANIC VAPORS IN POLYSTYRENE; INFLUENCE OF THE GLASS TRANSITION

(Publication No. 16,252)

Americo Ralph Di Pietro, Ph.D.  
Cornell University, 1956

The sorption-desorption method of studying the diffusion of organic vapors into polymeric films has shown that anomalies result if the system is in the glassy state, i.e., below  $T_g$  for the mixture. These anomalies were investigated more fully with cellulose acetate and a remarkable facet of anomalous sorption and desorption was uncovered. If the polymer film has a sufficiently large initial concentration, a sorption or desorption, to a different concentration, shows a two stage character. The first stage rapidly reaches a quasi-equilibrium and is Fickian; while the second stage is initially slow and anomalous. The present study extends this type of investigation and deals with the sorption and desorption of methylene chloride and of carbon disulfide in polystyrene and the effect of the glass transition on the diffusion.

Two types of serial diffusion experiment were carried out below the glass transition. One shows the effect on the diffusion of the magnitude of the initial concentration; and the other shows the effect of the concentration interval size.

Diffusion coefficients calculated from the first stage slopes and quasi-equilibriums increase with initial concentration, but, to the contrary, seem to be independent of

the size of the concentration interval, at least initially. Second stage slopes are essentially independent of both initial concentration and concentration interval.

Interpretations of some of these results are given in terms of the polymer matrix structure. However, to explain the second stage data, it was necessary to postulate an "induction period" which occurs between the quasi-equilibrium and the start of second stage take-up. A tentative explanation of the induction period is offered but a more exact interpretation awaits the results of more specific experiments yet to be done.

Two stage diffusion disappears at the glass transition and is replaced by standard Fickian diffusion for which diffusion coefficients can be calculated. Energies of activation calculated below the glass transition for first stage diffusion coefficients are lower by about 5 kcal/mole than those calculated for the overall Fickian diffusion above the glass transition. This has been interpreted as being due to the fact that, above the glass transition, temperature changes cause a greater increase in the volume of the polymer than the same temperature change below the glass transition. As a result the diffusion is enhanced more for a given temperature change above the glass transition than for the same change of temperature below. Hence the temperature coefficient and energy of activation are larger above the transition.

196 pages. \$2.45. Mic 56-2117

**A STUDY OF THE OXIDATION OF CARBON MONOXIDE OVER SINGLE CRYSTALS OF COPPER AND NICKEL USING A TRACER TECHNIQUE**

(Publication No. 17,224)

Joseph A. Feighan, Ph.D.  
University of Pennsylvania, 1956

Supervisor: Dr. Knut A. Krieger

Using radioactive tracers incorporated into the reactant and product gases a direct method of observation of the catalyst surface was developed. The method was applied to an investigation of the extent of adsorption of  $C^{14}O$  and  $C^{14}O_2$  on the 100 and 111 planes of single crystals of copper and nickel, and the oxidized surfaces of these planes. The mechanism of the oxidation of  $C^{14}O$  with oxygen over these catalysts was determined.

The oxidation of CO by  $O_2$ , either gas phase or chemisorbed, must take place by a mechanism involving the chemisorption of oxygen, reaction of gas phase CO with the oxygenated surface of the catalyst, and the regeneration of the original active oxygen species on the surface. Neither  $C^{14}O$  nor  $C^{14}O_2$  were strongly adsorbed on the catalyst surfaces between room temperature and about 400°C.

The active species was oxygen, freshly adsorbed on the metal or metal oxide surface. Two separate oxygen-surface complexes were formed, one very active for the oxidation reaction, corresponding to approximately monolayer coverage. The proposed mechanism postulated the continuance of the reaction at a rate dependent upon the rate of reformation of this active species from the gas

phase oxygen. Oxide or lattice oxygen was not active for the reaction below 400°C.

The sensitivity of the method for radioactive gases on the single crystal planes corresponds to less than 0.5% of surface coverage for the copper samples, and between 1-2% for the nickel samples.

105 pages. \$1.50. Mic 56-2118

**AN INDUCED DECOMPOSITION OF  $\alpha$ -CUMYL HYDROPEROXIDE: A KINETIC AND PRODUCT STUDY**

(Publication No. 16,374)

Kenneth Ralph Hartzell, Ph.D.  
Temple University, 1956

The importance of the elucidation of the mechanism of oxidation of hydrocarbons and of compounds containing hydrocarbon chains has been realized for many years. Most workers in this field agree that formation of hydroperoxides and peroxides and their subsequent decomposition constitute the principal path of this oxidation process.

The initial step requires the formation of an alkyl free radical. A significant theory for the initial production of this radical by thermal means has been offered by Rice and Herzfeld who claim that, whenever possible, scission of a hydrocarbon chain will occur rather than scission of a carbon-hydrogen bond. Bell and coworkers have proposed the formation of alkylperoxy radicals when molecular oxygen reacts with alkyl radicals. Alkylperoxy radicals may form hydroperoxides which then decompose by a free radical process.

The generally accepted mechanism for the thermal free radical decomposition of a hydroperoxide involves scission of the oxygen - oxygen bond to form alkoxy radicals which can subsequently react with solvent or inducing agent to form alcohols or decompose to form carbonyl compounds and gases such as methane.

A number of significant kinetic studies concerning the decomposition of hydroperoxides have been carried out by Kharasch and coworkers, Stannett and Mesrobian, and Smith. The thermal decomposition of  $\alpha$ -cumyl hydroperoxide in the solvent cumene has been found to be first order. The decomposition in  $\alpha$ -phenylethanol turned out to be 5/2 order. Kharasch has proposed a free radical mechanism for the thermal decomposition in cumene and an ionic initiation process for the decomposition in  $\alpha$ -phenylethanol. Smith has attempted to determine the relative inducing power of a number of solvents used for decompositions of  $\alpha$ -cumyl hydroperoxide.

The primary objective in the present investigation is to propose and elucidate a mechanism for the decomposition of  $\alpha$ -cumyl hydroperoxide in cumene with  $\alpha$ -phenylethanol added as an inducing agent.

The  $\alpha$ -cumyl hydroperoxide was purified by washing the prepared sodium salt and subsequently forming the pure hydroperoxide which was then distilled under vacuum. Cumene was purified primarily by distillation procedures, and  $\alpha$ -phenylethanol was treated with lithium aluminum hydride, extracted, and distilled under vacuum.

The apparatus for kinetic studies consisted of a thermostatted cell from which samples of the decomposition

mixture could be removed under nitrogen pressure. Weighed samples were treated with potassium iodide, acetic acid, and isopropyl alcohol, and heated under reflux. The liberated iodine was titrated with standard sodium thiosulfate solution. The percentages of hydroperoxide remaining in the various samples titrated were then calculated. The apparatus for product studies was constructed to retain after decomposition all of the reaction mixture including gaseous products. These products were then separated, identified, and estimated quantitatively by various means. The products were found to be  $\alpha,\alpha$ -dimethylbenzyl alcohol, acetophenone, di- $\alpha$ -cumyl, oxygen, and methane. The gases were analyzed by means of a Burrell-Orsat type gas analyzer. The  $\alpha,\alpha$ -dimethylbenzyl alcohol was identified and estimated with a Beckman Model DK-2 recording spectrophotometer. Acetophenone was estimated by preparation of the 2,4-dinitrophenylhydrogogene derivative. Di- $\alpha$ -cumyl was crystallized from the reaction mixture after removal of cumene. A proof of structure for this compound has been carried out, because the literature does not positively identify the compound.

Since Kharasch does not report the formation of water in his product data but included it in his mechanisms, the assumption was made that water was not formed. An attempt was made in this paper to modify his non-induced mechanism for the thermal decomposition of  $\alpha$ -cumyl hydroperoxide in cumene. The hydroxyl radical formed upon splitting of the hydroperoxide was consumed in the modified mechanism by cumyl radical, and all reactions involving water were deleted from the reaction scheme. This new mechanism gave only fair agreement with Kharasch's reported quantitative product data, but was in good agreement with his qualitative findings.

In order to arrive at a plausible mechanism for the induced decomposition as carried out in this work, it was necessary to determine the kinetics of the reaction in addition to product data. The reaction was found to be 3/2 order with respect to the  $\alpha$ -cumyl hydroperoxide concentration. The activation energy was calculated and found to be 19.6 Kcal./mole, a value considerably less than for a non-induced decomposition and slightly greater than for the decomposition in the solvent  $\alpha$ -phenylethanol.

The presence of water was tested for spectrographically and by the use of Karl Fischer Reagent and found to be negligible.

On the basis of the foregoing results a mechanism for the decomposition of  $\alpha$ -cumyl hydroperoxide in cumene with added  $\alpha$ -phenylethanol has been proposed. The initiation step consists of scission of the oxygen - oxygen bond in the hydroperoxide thereby forming cumoxy radicals. These radicals then react with the  $\alpha$ -phenylethanol to form  $\alpha$ -phenylethanol radicals which propagate the chain by reacting with hydroperoxide to form alkylperoxy radicals. The alkylperoxy radicals then react with themselves to form cumoxy radicals and oxygen or with cumyl radicals to form a diperoxide which decomposes to form more cumoxy radicals. Cumyl radicals are formed by interaction of alkylperoxy radicals with the solvent cumene. Di- $\alpha$ -cumyl is formed by reaction between two cumyl radicals, and hydroxyl radical is used up by cumyl radical. The extent to which the various reactions occur has been estimated on the basis of the quantities of the various products formed per mole of hydroperoxide decomposed.

It is found, further, that only those reactions involving the inducing agent  $\alpha$ -phenylethanol influence the over-all

kinetics of the reaction. The rate equation has been developed on this basis.

83 pages. \$1.04. Mic 56-2119

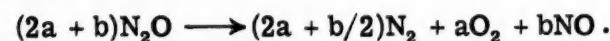
## THE DECOMPOSITION OF NITROUS OXIDE BY X-RAYS

(Publication No. 16,654)

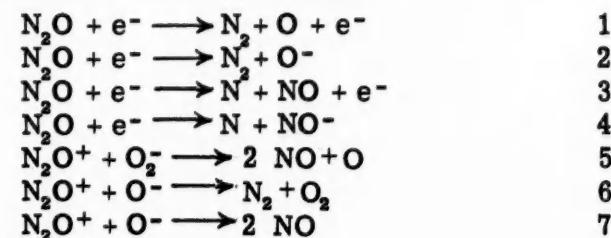
John Frederick Kircher, Ph.D.  
Syracuse University, 1956

The ion yields of the X-ray induced decomposition of  $N_2O$  have been studied over the pressure range from 50 to 555 mm. Hg. The ion yields were determined using the direct technique developed by Essex and his co-workers in this laboratory. This technique involves the measurement of the saturation ion current and can only be used with low ionization intensities. The gas used was condensable and the reaction was followed by freezing out the condensable gases with liquid nitrogen and measuring the residual pressure. The products of the reaction were  $N_2$ ,  $O_2$  and NO.

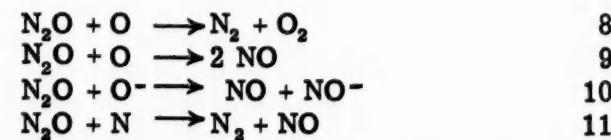
The amounts of NO and  $O_2$  formed were determined by analysis of the products and from these the  $N_2$  produced and  $N_2O$  decomposed was calculated using the following relationship.



The initial action of the X-rays may be ionization either with or without decomposition. The electrons thus released may also cause ionization with or without decomposition. In addition to these the following reactions were proposed as part of the overall mechanism.



These reactions are accompanied by the following secondary reactions.



All of these reactions are possible in the absence of a field since electrons with a wide range of energies are available.

At 200 mm the ion yield, defined as the number of molecules of  $N_2O$  decomposed per ion pair formed, is essentially constant at low fields. This indicates that recombination reactions are not occurring at this pressure. The ion yield of 4.84 increased at  $X/P = 1$  ( $X/P$  is the field strength in volts/cm. per mm. pressure) and became constant again at  $X/P = 5$  with a value of 9.43. The rise in the ion yield is ascribed to the action of electrons accelerated by the field. As the field is raised and the average energy of the electrons increases, reactions 1 and 2, followed by 8, 9, and 10 increase. At still higher energies reactions

3 and 4, followed by 11, become more important.

The field affects the NO yield more than the  $O_2$  yield. The NO yield increases from 2.24 at  $X/P = 0$  to 5.59 at  $X/P = 5.25$ . The increase in the  $O_2$  yield, over the same range, is very small, rising from 1.30 to 1.72.

Above  $X/P = 5$  the ion yield remains constant with increasing field strength. At this field strength all electrons become attached by the process of splitting with attachment, reactions 2 and 4. Once the electrons have become attached they are no longer able to initiate chemical reactions. At about  $X/P = 7$  the ion yield increases sharply due to splitting on ionization by the accelerated electrons.

At 555 mm the ion yield is the same as at 200 mm over the range from  $X/P = 0$  to  $X/P = 4.29$ .

The ion yield is initially higher at 50 mm than at 200 mm but drops from 6.87 at  $X/P = 0$  to 5.44 at  $X/P = 0.81$ . This is due to the inhibiting action of the field on ion recombination reactions. The decrease in the yield of 1.43 is probably the minimum contribution of recombination to the total yield at zero field. The decrease in the ion yield is due to a drop in those reactions producing NO. The  $O_2$  yield is unaffected by the field in this region. The decrease is due to recombination reactions 5, 6, and 7. This is not observed above 200 mm, probably because polarized molecules clustered about the ions do not permit effective ion-ion collisions.

At  $X/P = 1$  the yield is again increasing. The increase in the ion yield is greater at 50 mm than at 200 mm, reaching a value of 13.5 at  $X/P = 5.24$ . The increase in the rise of the yield is due to the larger fraction of the total negative ions which are electrons. The rise in the yield is almost entirely due to those reactions which produce NO. The  $O_2$  production is about the same as at higher pressures, increasing from 1.32 at zero field to 1.80 at  $X/P = 5.24$ .

The variations in the ion yield with changing conditions were almost all due to changes in those reactions leading to the production of NO. The  $O_2$  yield was unaffected by pressure and changed very little, with increasing fields, compared to the change in the NO yield.

A comparison of the present work with the alpha particle induced decomposition indicates that the mechanism for the two cases is the same.

67 pages. \$1.00. Mic 56-2120

#### PARAMAGNETIC RESONANCE AND THERMOCHROMISM

(Publication No. 17,071)

Walter Grahn Nilsen, Ph.D.  
Columbia University, 1956

The paramagnetic properties of certain thermochromic compounds have been investigated by paramagnetic resonance methods. Of particular interest were the solutions of some organic compounds in which the thermochromic effect has been interpreted as being due to the increase, with increasing temperature, in the concentration of a colored species in equilibrium with a colorless species. Solutions of bianthrone and related compounds which are known to exhibit this type of thermochromism have been

found to be paramagnetic in the present investigation; solutions of related compounds which are not thermochromic do not exhibit a paramagnetic resonance absorption in the temperature range in which the compounds are thermally stable. Qualitatively, a more intense paramagnetic effect is found in those compounds known to be more intensely thermochromic.

Quantitative paramagnetic resonance measurements were performed on dimethylphthalate solutions of 2,2'-dimethoxybianthrone. Measurements at different temperatures indicate that the paramagnetic state is formed from an equilibrium process and that the ground state is a non-paramagnetic state. The standard enthalpy change for the paramagnetic equilibrium obtained from the above measurements, was approximately the same as that reported for the thermochromic equilibrium in a similar solution. The concentration of the paramagnetic state was found in the present work to be proportional to the first power of the total concentration, in agreement with the functional dependence of the concentration of the thermochromic state on total concentration and therefore neither the paramagnetic nor the thermochromic phenomena can be accounted for by an association or dissociation mechanism. The absolute concentration of the paramagnetic molecules was also determined and the result yielded an equilibrium constant which was surprisingly low. The mechanism for both the paramagnetic and thermochromic phenomenon is discussed.

Solutions of certain pyrylospirans, which are known to exhibit a similar type of thermochromism as bianthrone and related compounds, are not found to be paramagnetic in the present investigation.

112 pages. \$1.50. Mic 56-2121

#### CHLORIDE AND THIOCYANATE COMPLEXES OF IRON IN PYRIDINE SOLUTION, AND THE PHOTO-OXIDATION OF IONS AND MOLECULES IN NON-AQUEOUS SOLVENTS (PARTS I AND II)

(Publication No. 16,660)

Donald Gerald Schweitzer, Ph.D.  
Syracuse University, 1956

#### PART I

Many of the chloride and thiocyanate complexes of ferrous and ferric iron have been identified in pyridine by spectrophotometric and conductimetric techniques and the existence of complex salts containing the anions  $FeCl_4^-$ ,  $Fe(SCN)_4^-$ ,  $FeCl_3SCN^-$ , and  $FeCl_2(SCN)_2^-$  has been established. The values of various extinction coefficients and equilibrium constants have been determined.

Evidence is presented establishing the photo-oxidation and the photo-reduction of the iron chlorides in pyridine, LiCl in pyridine, and HPyCl in pyridine, and of the iron thiocyanates in pyridine containing HPySCN and  $NH_4SCN$ . The order of magnitude of the quantum yield for the photo-oxidation of  $FeCl_3$  in pyridine and pyridine containing HPyCl and LiCl has been evaluated to within a factor of two.

Absorption spectra of the chlorides and thiocyanates of

Cu, Co, Ni, and Cr is presented along with evidence establishing the existence of the very stable complex Cu(SCN)<sub>2</sub> nPy.

### PART II

Rigid solutions of alkali metals in solvents containing methylamine show an absorption peak at 6000 Å. Upon illumination, a new band appears in the near infrared while the 6000 Å peak diminishes. The new band is attributed to incompletely solvated electrons. This same infrared band is found in illuminated rigid solutions of easily oxidized organic molecules, indicating, in agreement with previous work of Lewis and Lipkin, that photo-ejection of electrons has occurred. Upon slight softening of the solvent, solutions of such organic molecules frequently emit light (delayed luminescence). This luminescence can be maintained for hours if the solvent viscosity is properly controlled. The phenomenon is quite general and occurs in a wide variety of molecules. Evidence is presented which establishes that the luminescence is due to triplet states arising from recombination of radicals and trapped or solvated electrons, both formed originally by photo-oxidation of the parent molecule.

133 pages. \$1.66. Mic 56-2122

### PART I. THE STABILITY OF SOME SOLVENTS TO X-RAYS

### PART II. THE QUANTITATIVE ASPECTS OF PSEUDO FIRST ORDER KINETICS

### PART III. THE SEPARATION OF SILVER-111 FROM PILE-IRRADIATED PALLADIUM

(Publication No. 17,109)

Fred Sicilio, Ph.D.  
Vanderbilt University, 1956

Supervisor: Professor Merlin D. Peterson

#### PART I.

The work presented in this section is an investigation of the effects of radiation upon diethyl ether, tributyl phosphate, and methyl isobutyl ketone. These solvents are of primary interest in the separation of the fissile fuels (uranium and plutonium) from fission products, the "ashes" of nuclear reactors, by solvent extraction processes. During these separation processes, the solvent is subjected to very intense fission product radiation.

A 50 PKV, 50 ma x-ray beam which furnishes extremely high dose rates was used as a radiation source. With it, relatively short irradiation periods produce effects which are comparable to those furnished by hazardous fission product radiation, or to those furnished by long irradiation periods with high energy sources. Radiochemical techniques were used to assess radiation damage in terms of effects on the distribution coefficients of U(VI), Pu(VI), and fission products, and also on the retention properties of these solvents for the elements listed.

The absorption coefficient for each solvent was determined by use of a ferrous sulfate dosimeter system, and the total energy absorbed was calculated for each solvent irradiation. Comparison of the radiation stabilities of

these solvents were made on the basis of dose received by each solvent.

At a dose of 25 watt-hr/liter, which corresponds to  $5.6 \times 10^{23}$  ev/liter, the relative radiation stabilities, in increasing order, were found to be

tributyl phosphate    methyl isobutyl ketone    diethyl ether.

### PART II.

The application of pseudo first order kinetics to second order reactions is discussed in this section. Many experimentally determined pseudo first order velocity constants have associated with them appreciable errors caused by a mathematical assumption in the derivation of the pseudo first order expression. This investigation was undertaken with the purpose of developing a quantitative method for the treatment of this application.

The implications resulting from an inherent mathematical error in pseudo first order kinetics are discussed. The error is independent of the absolute reactant concentrations and dependent only on the ratio of these concentrations and on the extent of reaction.

Quantitative calculations of the errors were made for various ratios of initial reactant concentrations and extents of reaction. The errors in initial reactant rates were found to be 20%, 10%, 4%, and 1% for initial reactant concentration ratios of 5, 10, 25, and 100 respectively. The errors decrease throughout a reaction, and the value of the experimentally determined velocity constant approaches a true first order constant which, however, is dependent on the absolute values of the initial reactant concentrations.

### PART III.

This investigation deals with the development of a suitable procedure for separating radioactive Ag<sup>111</sup> from other elements present in neutron-irradiated Pd metal. Chemically pure Ag<sup>111</sup> with high yield and high specific activity was desired. The process had to be non-hazardous, relatively simple, and suitable for multi-millicurie quantities of Ag<sup>111</sup>. Careful examination of each previous separation by different authors listed in this paper indicated that they did not meet the requirements set forth.

A remotely controlled, shielded glass apparatus was designed specifically for precipitation-type separations. The Pd metal was dissolved in aqua regia and 20 mg. of silver carrier as the chloride complex was added. The separation involved precipitation of silver chloride by dilution, dissolving again in ammonium hydroxide, followed by reprecipitation. The product was recovered in ammonium hydroxide solution or, if silver nitrate was desired, by metathesis to silver oxide, which was then dissolved in nitric acid. The yields were greater than 90%. The products contained less than 1 gamma of palladium, and no activities other than that of Ag<sup>111</sup> were detected, even after decaying for 10 half lives. The Ag<sup>111</sup> content was about 50 mc. in the highest activity product, and tests indicated that the method may be suitable for much larger quantities of Ag<sup>111</sup>.

103 pages. \$1.50. Mic 56-2123

THE KINETICS OF DEUTERIUM EXCHANGE  
BETWEEN ACETYLENE AND WATER

(Publication No. 17,099)

Irving Fred Stacy, Ph.D.  
Columbia University, 1954

The rate of exchange of deuterium between water and dissolved acetylene at low deuterium concentration was investigated. A novel glass-enclosed magnetically driven stirrer produced efficient agitation of the solution and gas phases without leakage of gas while the reaction vessel was immersed in a thermostat. Samples of the gas phase were removed at known time intervals and analyzed in the mass spectrometer to follow the rate of appearance of deuterated acetylene.

A completely general rate equation for bimolecular exchange has been derived. For the case of deuterium exchange between acetylene and water at low deuterium concentration, an equation for the rate of appearance of deuterated acetylene is presented. That the first-order equation is valid is indicated by the fact that the graphs of the logarithm of the fraction of the way still to go to equilibrium versus time are straight lines. Values of the time required for the reaction to proceed one-half of the way to equilibrium have been calculated from these data.

It is shown that the half-time for exchange is independent of the acetylene pressure above the solution and of the total deuterium concentration at 3 atom percent deuterium or less. The half-time was found to be inversely proportional to the volume of solution (in a constant total volume of solution and gas) and to the hydroxyl ion concentration in solution. No evidence for salt effects or general base catalysis was found.

These results are consistent with a mechanism involving the slow reaction of hydroxyl ion with acetylene according to the equation



followed by the reaction of the acetylidyne ion with deuterated water as follows:



The second order forward rate constant, corresponding to homogeneous exchange in solution, is  $162 \pm 21$  l./mole sec. at  $25^\circ\text{C}$ . From the slope of the graph of  $\log k$  versus reciprocal temperature in absolute degrees, the experimental activation energy is  $13.9 \pm 3.1$  kcal./mole.

Preliminary experiments with anion exchange resins showed that the hydroxyl form of Amberlite IR-4B, a weak base resin, does not catalyze the exchange measurably. The hydroxyl form of the strong base resin, Amberlite IRA-400, acts as catalyst, the resulting half-time being less than six minutes, too short to measure in the batch method used in this research.

110 pages. \$1.50. Mic 56-2124

THE STANDARD POTENTIAL OF THE COBALT AMALGAM AND ACTIVITY COEFFICIENTS OF AQUEOUS SOLUTIONS OF COBALT SULFATE

(Publication No. 16,983)

Ernest Sturch, Jr., Ph.D.  
The University of Oklahoma, 1956

Supervisor: Dr. B. O. Heston

The experimental determination of the activity coefficients of certain bivalent sulfates is limited by the experimental methods and the properties of the substances involved. Electromotive-force measurements using a suitable cell is a standard method for the measurement of activity coefficients of strong electrolytes. The difficulty involved in this method can usually be attributed to the inability to obtain a reproducible electrode reversible to the metal. This is particularly true for cobalt. Cobalt metal is difficult to obtain in a highly purified form. In addition, metallic cobalt is extremely passive. For these reasons, activity coefficients of cobalt sulfate have not been determined experimentally.

To obtain activity coefficients for cobalt sulfate, the following innovations were introduced to the electromotive-force method: (1) a cobalt amalgam was used as the electrode reversible to cobalt; (2) a Compton quadrant electrometer was used for the null-point measurement to avoid polarization during the measurements; (3) the system was kept under an atmosphere of  $\text{O}_2$  free nitrogen. A  $\text{Hg}-\text{Hg}_2\text{SO}_4$  reference half-cell was used to eliminate junction potentials. Potential measurements were made on the cell,  $\text{Pt},\text{Co}(\text{Hg})(\text{sat});\text{CoSO}_4(\text{a});\text{Hg},\text{Hg}_2\text{SO}_4(\text{s})$ , and using solutions of  $\text{CoSO}_4$  varying in concentration from 0.230 molal to 0.00123 molal.

The potentials obtained from the above cell were used to determine the standard electrode potential for the cell by a suitable method of extrapolation. The resulting standard potential of the cell was used to calculate the activity coefficients of cobalt sulfate at the various concentrations.

The extrapolation plot was found to deviate from the slope predicted by theory in the upper concentration range. The extrapolation method used must be relegated to the dilute solutions where a straight line is obtained. The deviation in the high concentrations does not effect the extrapolated value for the standard potential. This deviation is an indication of the individual behavior of cobalt sulfate in this region.

The standard potential of the cobalt amalgam may, or may not be the same as that for cobalt metal. If a difference exists, it is slight. The experimental value obtained was a little less than the calculated values. The activity coefficients obtained for cobalt sulfate were intermediate to values of other bivalent sulfates at the higher concentrations and comparable in the lower concentrations.

Based on the results obtained, the cobalt amalgam is a satisfactory reversible electrode for potential measurements. However, because of the reactivity of amalgams in general, special treatment is necessary in order that they behave reversibly and reproducibly as electrodes.

49 pages. \$1.50. Mic 56-2125

**STUDIES OF SURFACE PHASES OF CHARCOAL AND COPPER**

(Publication No. 16,745)

Robert Earle Vander Vennen, Ph.D.  
Michigan State University, 1954

A study has been made of the nature of the surface of activated charcoal, of the manner in which electrolytes are adsorbed by charcoal, and of the reaction at room temperature between oxygen and metallic copper.

Very little precise information is available about the structure of the surface of activated charcoal. A review of the literature showed that the dominant role in determining the surface properties of charcoal is played by oxygen chemisorbed on the carbon surface. By suitable changes in the conditions of activation of charcoal the nature of the carbon oxides on the surface changes and the adsorption properties of the charcoal also change. The structure of charcoal activated at 400°C. and the adsorption of cations by this charcoal from aqueous solutions was the chief interest of the present investigation.

Ash-free charcoals were prepared from pure sugar and activated under controlled conditions. Analyses for the elements present were performed and the adsorption of iodine by the charcoals was measured under standard conditions. The charcoals were further characterized by their abilities to adsorb acids and bases. The magnetic susceptibilities of a number of charcoals activated under different conditions were determined at room temperature and also at 192°K. and 75°K. It was found possible by the magnetic measurements to determine the amount of oxygen adsorbed physically on the charcoal surface, since molecular oxygen is paramagnetic. Charcoal free from oxygen was prepared and it was found to be more diamagnetic than oxygen-containing charcoal and its susceptibility was independent of temperature.

Other methods of studying the nature of the surface carbon oxides of charcoal included direct chemical oxidation of the charcoal surface with sodium metaperiodate, which oxidation yielded carbon dioxide. The infrared absorption spectra of several charcoals prepared as mulls were obtained in an attempt to obtain information about the structure of surface oxides. Studies were made of the reaction at room temperature of charcoal with water enriched in the oxygen isotope O<sup>18</sup>.

In a study of the nature of the adsorbed phase when electrolytes were adsorbed on charcoal, the magnetic susceptibilities of salts of iron, cobalt, and manganese adsorbed on charcoal were determined. The magnetic susceptibilities of these salts were found to be the same in the adsorbed state as they are in the crystalline form.

From magnetic measurements at low temperatures, these salts in the adsorbed state were found to obey the Curie-Weiss law for paramagnetic substances. It was concluded from these results that the salts were held on the charcoal surface by bonds between metal and oxygen atoms, and a mechanism for the adsorption process was postulated.

The surface oxidation of granulated metallic copper was studied at room temperature and at 100°C. by the method of magnetic susceptibilities. It was found that the reaction could be accounted for magnetically by the formation of cuprous oxide, cupric oxide, and by the presence of physically absorbed oxygen. From independent determi-

nations of the total amount of oxygen absorbed and from magnetic measurements at room temperature, 192°K., and 75°K. the amounts of each of the constituents present were calculated. The gram susceptibilities of cuprous oxide and cupric oxide were also determined at the three temperatures.

175 pages. \$2.19. Mic 56-2126

**BONDING BETWEEN MONTMORILLONITE CLAY PARTICLES**

(Publication No. 17,013)

Benno Peter Warkentin, Ph.D.  
Cornell University, 1956

This thesis describes an investigation of forces of attraction between clay particles which may be of importance to the structure of agricultural soils.

Forces involved in flocculation, compressive strength of the floc structure and stability of the floc toward disruptive forces of swelling and mechanical shear were investigated. The montmorillonite-polymer anion bond was examined in terms of its chemical nature, factors influencing bond formation and stability of the bond toward swelling and shearing stresses.

The magnitude of the positive charge on the clay plate edge was measured from decreased negative adsorption of anions. The role of clay decomposition products in determining the properties of acid clay was investigated utilizing a resin-exchange method for preparing homoionic clays.

Flocculation of colloidal montmorillonite particles in dilute suspensions can be explained as a stabilization of random edge-to-face contacts by electrostatic bonds. This builds up primary units which grow together to form a network with some structural strength. This structure may be used to distinguish flocculated from dispersed samples after centrifuging. The theoretical valence effect on flocculation was verified for sodium and calcium saturated montmorillonite indicating that the repulsive forces between clay plates were accurately described by double layer theory. Attractive forces, which were markedly decreased by small amounts of metaphosphate, were assumed to arise from positively charged sites on the clay plate edge.

An optimum anionic polymer concentration, equal approximately to the equivalents of positive charge on the clay particles, was found for formation of the clay-polymer bond. Larger amounts of polymer rendered the suspension more dispersed, and lesser amounts formed an insufficient number of bonds. Decreased effective distance between clay particles achieved by increasing the clay or electrolyte concentration, or increasing the polymer chain lengths was found to favor bond formation. The results on bond formation can be adequately explained by assuming an electrostatic bond between the polymer anion and the positively charged sites on the clay edge. The clay-polymer bond formed in dilute clay suspensions was stable to disruptive forces of swelling, but the polymer chain could be broken by mechanical shear forces.

Double layer equations accurately described swelling of concentrated suspensions of sodium montmorillonite.

In calcium montmorillonite there is evidence for additional attractive forces becoming effective at small inter-particle distances.

From negative adsorption measurements and double layer theory a surface area of nearly  $800 \text{ m}^2/\text{gm}$  was found for the montmorillonite sample used. This sample had between 0.04 and 0.004 me/gm positive charge in suspension at pH 7.

A resin-exchange method was found to be suitable for preparation of pure homoionic clays without preparation of acid clay. An acid clay prepared by resin-exchange had the titration properties of a strong acid, but on aging aluminum ions replaced the hydrogen altering the titration characteristics.

95 pages. \$1.50. Mic 56-2127

## ECONOMICS

### ECONOMICS, GENERAL

#### COST-QUANTITY RELATIONSHIPS IN THE AIRFRAME INDUSTRY

(Publication No. 17,374)

Harold Asher, Ph.D.  
The Ohio State University, 1956

For many years the airframe branch of the aircraft industry and the Air Force have estimated the direct labor cost involved in producing aircraft as a function of the quantity of aircraft to be produced. This relationship between labor cost and quantity is generally regarded as a linear curve on logarithmic grids, and implies that each time the total quantity of aircraft produced doubles, unit labor cost declines by some constant percentage. As the number of units produced becomes very large, unit labor cost is believed to approach zero as a limit.

Although this linear curve, now known as the progress or learning curve, is most frequently used to describe the relationship between the labor cost of producing aircraft and cumulative output, it is also applied in several other ways. It is used (1) to estimate total airframe production cost, (2) to estimate total production cost of products other than airframes, (3) to estimate production schedules, and (4) to compare the costs of alternative weapon systems.

The progress-curve concept has not figured prominently in the literature of economics. Theoretical and empirical economic writings have traditionally treated cost as a function, not of cumulative output, but rather of rate or level of output. Also, an inherent feature of the progress curve is that technical knowledge changes, presumably, as each reduction is made in unit cost. However, the economist assumes technical knowledge to be constant for all cost-rate-of-output observations in a given sample. In spite of these differences, if the progress-curve concept is valid, then it is apparent that it should be reconciled with the more conventional economic approach to analysis of cost.

The primary purpose of the study was to explore the possibility that the linear formulation of the progress curve may not be an accurate description of the rates at which cost declines as output increases. However, no attempt is made to question the usefulness of this linear curve for certain purposes. For example, the linear curve may still be appropriate for obtaining cost approximations in cases involving relatively small numbers of units of given models

or in cases in which rough estimates are adequate.

Empirical cost data for several fighter aircraft (post-World War II) were obtained from the United States Air Force and from a number of airframe manufacturers. It was found that when the components of labor cost (i.e., fabrication, sub-assembly, and major assembly) and total production cost (i.e., labor, materials, and overhead) are plotted separately on logarithmic grids, the curves are diverse in slope and shape. They decrease at different rates. Also, several of them depart from linearity. The result is that the sums of these component curves for both labor and total production cost appear to be convex rather than linear when plotted on logarithmic grids.

The study seemed to indicate further that instead of approaching zero as a limit, labor cost appears to approach a limit established by a minimum cost for fabrication, while production cost appears to approach a limit established by a minimum cost for materials. A relationship was developed between the labor cost of producing the first unit of a given model and the rate at which cost declines toward a minimum for succeeding units. It is believed that the same kind of relationship may be developed for other types of aircraft and for the remaining elements of production cost.

Although both the variables and assumptions of conventional economic-cost research differ from those of progress-curve research, a tentative reconciliation may be attempted. Empirical economic studies have indicated, with a few exceptions, that marginal cost appears to be constant within the range of observations available. As pointed out earlier, an inherent feature of the progress curve is that technical knowledge changes as unit cost declines. However, if a limit to the reduction in unit cost exists in the case of the progress curve, then at that stage of cumulative output it can be assumed that technical knowledge remains relatively fixed. Thus, if the progress curve for a given product has reached a minimum, the marginal cost curve should be horizontal at that time, and the two curves, the marginal cost curve and the progress curve, should have the same ordinate.

282 pages. \$3.65. Mic 56-2128

**ANTHRACITE COAL: A STUDY IN  
ADVANCED INDUSTRIAL DECLINE**

(Publication No. 17,208)

Theodore Bakerman, Ph.D.  
University of Pennsylvania, 1956

Supervisors: Dr. Gladys L. Palmer  
and Dean C. Arthur Kulp

Three major fields are analyzed. These are the economics of the anthracite industry, the demography of the Anthracite Region, and the labor force, employment and unemployment status of anthracite miners. For most aspects, the period covered extends from 1930 through 1953.

Supply and demand factors are treated separately and in their interrelationships. Supply factors that are analyzed include reserves, the components of production costs, and transportation and distribution costs. Special attention is devoted to the place of labor costs in the total of production costs. The conditions under which changes in productivity might influence labor costs and production decisions are evaluated.

Demand is traced historically, by sector. A standardization factor is applied for the purpose of eliminating the effect of changes in the weather. Estimates of household and commercial consumption are made, showing an upward movement in the latter sector of consumption.

Analysis of the demography of the Anthracite Region reveals the development of distinctive characteristics. During the decade from 1940 to 1950, large scale outmigration of males in the younger age groups took place. This caused the median age of the population in the area to rise, and led to a low ratio of males to females. Marriage rates in the area are relatively low for all age groups of males. Although these rates have risen over a period of years, a distinct differential is preserved relative to rates for the State of Pennsylvania.

A detailed investigation was made of the unusually low labor force participation rates among males in the region, as shown in the census of population of 1950. It is concluded that there was response bias on the part of those who were enumerated who classified themselves as "unable to work."

A concept of an industry labor force is established. The validity of the application of this concept to the anthracite industry is tested through a comparison of mobility patterns of anthracite workers with those of workers in other industries. From the results of this comparison, there appears to be a strong basis for applying the concept to the anthracite industry. Finally, through the use of empirical data from governmental and non-governmental sources, estimates of labor force, employment and unemployment are developed for a number of years in the period from 1930 through 1953. Data of the Bureau of Old-Age and Survivors Insurance are used in conjunction with those of the Bureau of Labor Statistics to arrive at estimates of unadjusted unemployment or disemployment. Further adjustments are made through the use of data of the Anthracite Health and Welfare Fund, as well as those from other sources.

295 pages. \$3.80. Mic 56-2129

**THE DERIVATION OF CAPITAL COEFFICIENTS  
FOR INPUT-OUTPUT ANALYSIS: A STUDY  
OF THE MACHINE-TOOL ACCESSORIES INDUSTRY**

(Publication No. 17,216)

Philip J. Bourque, Ph.D.  
University of Pennsylvania, 1956

Supervisor: Professor Raymond T. Bowman

This study has as its purpose the discussion of the problems involved in one aspect of interindustry economics: the empirical derivation of capital coefficients for individual industries. The capital requirements in the machine-tool accessories industry for use in an interindustry study of the United States during the Korean period is taken as a pertinent example. It is believed that the capital coefficients derived for this industry are of interest as they may contribute to the substantive completion of an overall dynamic input-output table for the United States. The machine-tool accessories industry aptly illustrates some of the difficult problems in the derivation of capital coefficients. An analysis of these problems should be instructive for investigators dealing with other industries.

The capital coefficient is generally defined as the ratio of the stock of capital to the output that stock of capital can or does produce. There are numerous capital coefficient concepts, depending upon the scope of the definition of capital in the numerator of the ratio, and the definition of the output concept in the denominator. The capital coefficients derived in this study are termed marginal fixed capital coefficients based on a capacity-defined concept, describing the capital requirements of the machine-tool accessories industry under conditions of industrial expansion.

The principal source of information utilized in the investigation has been transcripts of applications for tax amortization certificates. The analysis of these transcripts was undertaken because, given the goal of deriving a matrix of capital coefficients, these data appeared to offer the required information in a manner not hitherto available. The advantages and limitations of the data are fully considered.

The capital coefficient for each establishment was derived and industry averages and measures of dispersion were computed. The weighted arithmetic mean capital coefficient for these establishments was \$.216 but most striking was the range of variability, from \$.027 to \$1.112 per dollar's worth of capacity acquired. Factors contributing to this variability are considered. Product differences within the industry do not appear significant; the amount of expenditures and the size of the expanding establishment both appear to be statistically significant factors associated with the variability among the capital coefficients but the conclusion that diseconomies are associated with the size of expansion and economies are associated with the scale of the expanding establishment is but one possible interpretation of the results.

Another factor which may explain the wide variation among the capital coefficients in different establishments in this industry is the degree of "balance", defined as a situation in which no excess capacity exists in any process either before or after an expansion. Many expansions, it appears, were for the purpose of eliminating bottlenecks in fixed capital equipment; others involved the deliberate overbuilding of facilities. The capital coefficients sought

for the dynamic input-output model are those which describe the costs of expanding from one equilibrium level of capacity to a new higher level, i.e., a balanced expansion.

Expansions were separately analyzed for balance. While there are numerous practical difficulties associated with the identification of balance and in the averaging of balanced establishment coefficients to arrive at an estimate of the balanced industry coefficient, an estimate of the overall fixed capital costs per dollar's worth of capacity, in terms of 1950 prices, is \$.22. This overall cost estimate is so broken down as to indicate how much must be purchased from each of the industries producing fixed capital equipment used in the production of machine-tool accessories.

189 pages. \$2.50. Mic 56-2130

#### ECONOMIC ASPECTS OF THE GULF COAST OFFSHORE OIL CONTROVERSY

(Publication No. 16,970)

David Robnett Fitch, Ph.D.  
The University of Oklahoma, 1956

Supervisor: Dr. W. N. Peach

The division of the land under the marginal sea between the States and the Federal Government has led to important changes in the development of oil, gas, and sulphur in the Gulf of Mexico. The scope of the present study is limited to certain aspects of the offshore resource development, namely, the valuation of the resources, the cost of their extraction, the risks encountered, the institutional factors involved, and the international and domestic precedents established by the Submerged Lands Act. Sources of information included governmental documents, oil industry publications, personal interviews and correspondence with principals, and newspaper and periodical files.

The submerged lands conflict constituted one phase of the continuing struggle over the central government's place in the nation's economy. Inland "States' Rights" groups aided the coastal States in obtaining the Federal quitclaim to submerged lands within "historic State boundaries." The legislation was hailed and condemned as precedent for later disposal of other Federal lands and proprietary activities.

Although competent geological estimates of offshore resources have been distorted for political purposes, an ultra-conservative value computation indicates the States may receive \$0.9 billion, the Federal Government \$7.0 billion. Exact production costs are undeterminable; higher per well drilling costs offshore are offset by probable savings in exploration, leasing, and efficient well placement. Existing evidence suggests that unit production cost offshore likely approximates that onshore. Physical risks of marine petroleum production are countered by casualty insurance; the dry hole risk for large diversified operators is calculable from past experiences and largely canceled by certain Federal tax provisions.

Leasing practices for all governmental units concerned are almost identical. If the institutional rigidities common in onshore development are discarded and if the advantages of single ownership, large-sized lease tracts, and freedom from wasteful competitive drilling are utilized, optimum

engineering efficiency may emerge in the submerged lands.

Resource extraction in these lands is carried on under similar conditions, regardless of which government owns and administers the land. When the decisions of one seem to work out well, the other governmental units commonly adopt them. The most noteworthy drawback to the Submerged Lands Act is in the dangerous precedents it sets for restricting freedom of the seas and possibly for ending Federal ownership and protection of the public domain.

316 pages. \$4.05. Mic 56-2131

#### VALUE ADDED BY AGRICULTURE, MINING AND MANUFACTURING IN THE UNITED STATES, 1840-1880

(Publication No. 17,228)

Robert Emil Gallman, Ph.D.  
University of Pennsylvania, 1956

Supervisor: Dr. C. R. Whittlesey

The study was motivated by a desire to provide a basis for national income estimates for the American economy during the period 1840 through 1880. The period was one of rapid material advance, but, except for the last decade, we have no acceptable comprehensive measures of the performance of the economy. Such measures are important for the study of economic development.

The study was confined to the three principal commodity producing sectors -- agriculture, mining and manufacturing. The measure of performance used was value added. Value added by the three sectors can be summed to give an approximation to the net value of commodity output. Value added estimates, by sector, indicate the contribution of each sector to the economy and can serve as bases for income origination estimates.

Estimates were made in current prices and prices of census year 1880 (June 1, 1879 through May 31, 1880). Prices of census year 1880 were applied to agricultural output (net of internal duplication) and mining output, product by product. The minor adjustments required to convert these estimates to value added, in constant prices, were made by assuming that the prices of purchased commodities moved in the same way as the prices of goods produced. Manufacturing value added was deflated by use of an index reflecting the prices of manufactured products and the commodities purchased by manufacturing.

Estimates were made at decennial intervals, based largely on federal census data. These estimates were interpolated on series drawn up (in the main) from data of state censuses, the Department of Agriculture and the Geological Survey to give estimates for the years (census) 1845, 1855 and 1875. Various tests were devised for the data and the literature of the period was searched for criticisms of the data. Weak data were replaced by estimates. Gaps in census coverage were filled in the same way. We reached the conclusion, however, that the basic data are stronger, by and large, than has been conceded hitherto.

Each of the three sectors grew rapidly between 1840 and 1880. In current prices, agricultural value added of 1880 was over 3 1/2 times value added of 1840; mining,

about 18 1/2 times; manufacturing, over 8 times. In constant prices, value added in 1880 was about 3 1/4, 22 1/2 and 11 times value added of 1840, for agriculture, mining and manufacturing, respectively. Value added by agriculture, in constant prices, expanded consistently at the rate of population growth. Since agricultural productivity improved markedly over the period, an increasing share of the labor force was made available to other sectors, accounting in part for the extraordinarily rapid growth of mining and manufacturing.

Real value added by each sector grew more rapidly between 1840 and 1880 than did the output of each sector during the first forty years of the Twentieth Century. The growth of mining and manufacturing per member of the population was also more rapid in the earlier period than later, but the performance of agriculture, per member of the population, was about the same in each period. Due to the very heavy weight of the agricultural sector in the earlier period, the growth of commodity output between 1840 and 1880 was only slightly more rapid than in the early Twentieth Century, and output per member of the population actually expanded at a lower rate than in the later period.

390 pages. \$5.00. Mic 56-2132

#### THE SURPLUS FUNDS OF RURAL ELECTRIC COOPERATIVES: A CASE STUDY

(Publication No. 16,759)

Thomas Virgil Gates, Ph.D.  
The University of Oklahoma, 1956

Supervisor: Dr. W. N. Peach

Basic statistics for this study were operational data from sixteen rural electric cooperatives in Oklahoma for the period 1947-1952. The central problem was to trace the flow of funds in order to indicate the source and uses of surplus funds. "Surplus" was defined as the amount by which the flow of funds into cooperatives exceeded payments.

Operations of the cooperatives were classified as (1) those related to funds borrowed from the Rural Electrification Administration to finance construction, and (2) those related to the purchase and sale of electricity. Since the funds obtained from REA were limited to use on construction projects, they were not considered a part of surplus. The area of operations related to the purchase and sale of electricity was analyzed by use of balance sheets, operating statements, and reports of loan fund transactions submitted to REA by cooperatives. This analysis showed that the surplus amounted to \$7,133,700, held in the following forms: (1) working capital, \$3,144,200; (2) investments in fixed assets, \$3,148,100; and (3) advance payments on principal, \$841,000.

The surplus arose from purchase and sale of electricity, but operating margins did not contain a balance of sufficient size to account for the surplus. Examination of the accounting system disclosed two accounts with large balances charged against operations, but which had not resulted in an equivalent payment: (a) depreciation reserve and (b) deferred interest accounts. In this way the surplus

was accumulated even though cooperatives did not show a large operating margin.

The use of the surplus is partly indicated by the nature of the accounts in which it is held. Cooperatives have used the surplus (1) to build up a cushion of credit by making advance principal payments, (2) to increase the amount of fixed assets, and (3) to build up their working capital position. The working capital was composed largely of general cash and investments. Over \$1,000,000 was held in the form of general cash, and \$1,444,800 was invested in government bonds, federal savings and loan associations, and investment companies. The remainder of the working capital was held in the form of prepayments, notes and accounts receivable, and miscellaneous debits.

257 pages. \$3.25. Mic 56-2133

#### ECONOMIC DEVELOPMENT OF JAPANESE AGRICULTURE: AN APPRAISAL OF THE SIGNIFICANCE OF LAND TENURE IN AGRICULTURAL DEVELOPMENT

(Publication No. 16,177)

Motosuke Kaihara, Ph.D.  
The University of Wisconsin, 1956

Supervisor: Professor Kenneth H. Parsons

Japanese agriculture is well characterized as rice farming and the economic development of agriculture has been closely connected with the land tenure system.

The remarkable increase in the production of rice after 1868 depended significantly upon the interest of the landlords in improved technology which was stimulated by the custom under which the landlords reduced the rents in case of crop failure. The landlords had sufficient political power to secure strong tariff protection for rice.

From the beginning of industrialization, the state levied a heavy land tax upon the recently recognized private ownership of land, with the rate of rental payments by the tenants continuing at approximately the same share of the crop as under the earlier feudalism. Local governments were financed by a household tax, which was paid by the cultivators, rather than by a land tax. The landlords invested their savings in the new industries.

The rate of growth in per capita national income has been relatively lower in agriculture and other primary industries, than in other sectors of the economy. The level of consumption of rural people has been significantly lower than that of city workers, but did increase with the rising total income of the agricultural sector. Daughters growing up in farm-households provided a source of cheap labor for the textile industry of Japan until World War II.

But by 1920 the peasants had begun to organize sporadically for greater benefits from economic development. For tenants, this activity took the form of bargaining over rents. An important fruit of this effort was the achievement of some security of tenure through customary rights.

A strong national policy of industrial expansion brought out an anti-landlord political alignment regarding price policy for rice. The very great development of Japanese rice production in Taiwan and Korea after 1930, had the effect of a drastic disturbance in the domestic market of rice.

Under these conditions Japan had an opportunity to reorganize the economic structure, having reduced the influence of the landlords in the economy. However, the policy continued to one of price control of rice favorable to the landlords, which policy was also connected with militarism. The fundamental human rights of the peasants were almost completely neglected. Under these circumstances agriculture was regarded substantially as a source of food and of manpower for the military. Economic development among farm people thus was pegged at a low level.

During the period of this study, roughly 1868 to 1939 peasants made little headway toward their own economic advancement. As individuals they improved the technology of their cultivation. But through their collective action the tenants did not succeed in changing greatly the general terms of renting. Politically, this means that although the peasants were something of a pressure group in the state, their status was very far from that achieved by farmers in Western democracies.

We conclude that this is both the cause of the spotty development of agriculture in the Japanese economy and a strong contributor to the rapid expansion of Japanese industry in the state. The Japanese peasants worked hard and produced more with few rewards.

228 pages. \$2.85. Mic 56-2134

#### THE ROLE OF RESIDENTIAL CONVERSIONS IN THE HOUSING MARKET

(Publication No. 17,066)

Benjamin Lipstein, Ph.D.  
Columbia University, 1956

This study of residential conversions investigates, (1) the competitive position of residential conversions in the standing stock--cross section analysis, and (2) the activities of the converter during the construction period and (3) the long run economic forces leading to conversion.

The limited time series data examined in the study showed that, cyclically, conversion activity is highly correlated with new dwelling unit construction. However, over the three decades studied, 1920 to 1950, conversion activity has been of increasing importance with respect to additions to the housing inventory. A prerequisite for this growth in number of converted dwelling units was an increasing body of old structures that were exhibiting a decline in quality of services. The demand to a large extent during this period was provided by the increase in number of small families. In many respects, the fact that the characteristics of converted dwelling units meet the needs of these small families has accounted for the success of conversions.

Three-quarters or more of all conversions in most of the sample areas examined were located in structures built before 1920. It is mostly these structures that have suffered a decline in the quality of their services. These structures, which are primarily single family residences, are owned to a large degree by aged heads of households. For many owners of these aged structures, there is a considerable incentive to convert. The costs of conversion are moderate, well within the financial means of most of these families, and the relative returns are great. Con-

version is a means of salvaging frozen investment in an old house.

The local areas examined in this study exhibited considerable variation in the relative importance of conversions. A growth in the number of households must underpin any increase in dwelling units, whether new or converted; however, in most regions of the country, a direct relationship between population increase and conversions was not found. Regional and city differences in the aggregate rate of conversion were best accounted for by the proportion of aged structures. The average rate of conversion in all sample areas in structures "built before 1920" was 13 percent, less than half that in the next age group "1920 to 1939" and about one percent for structures "built after 1940". In old cities, the need for additional dwelling units was filled in large degree through conversion, since there was a considerable base of old structures from which conversion would be made. In the newer cities, conversion of aged structures was used to a maximum. However, the base of old structures was inadequate to fill even a moderate part of the need. In these areas, new dwelling unit construction was the primary means for obtaining additional shelter.

Contrary to general opinion, conversion is not a localized phenomenon in the center of the city, but rather is widely dispersed throughout the built-up parts of the city. Wherever there are well established old neighborhoods with fully developed facilities, converted units are likely to be found.

Determining the quality of converted dwelling units was one of the main objectives of this study. The quality of converted dwelling units in this report was measured in terms of available plumbing facilities and dilapidation. It was found that conversions for the most part are a reflection of the existing stock of housing. In general, dilapidation rates were less for converted dwelling units than for all tenant-occupied units. On the basis of the data presented in this study, the contention that converted dwelling units are for the most part inferior must be rejected. On the contrary, the majority of conversions are of good quality. The hypothesis that conversion leads to overcrowding and in turn deterioration of the neighborhood is found to be untenable on the basis of available data. The study contains a number of important policy implications for zoning laws and town planning.

The primary contribution of this investigation is that it provides an economic framework for the consideration of conversion activity. The author has organized and interpreted a body of basic information on residential conversions. A number of hypotheses are viewed in terms of information hitherto unavailable, removing much of the speculation that has dominated this area.

184 pages. \$2.40. Mic 56-2135

METHODS OF ESTIMATING TRANSFER PAYMENTS  
IN THE COUNTIES OF OKLAHOMA

(Publication No. 16,980)

Paul Eric Nelson, Ph.D.  
The University of Oklahoma, 1956

Supervisor: Dr. W. N. Peach

Personal income has become one of the significant measures of the economic well-being of a nation. The National Income Division of the United States Department of Commerce prepares the official estimates of personal income for the nation. This agency also prepares annual data for each state. During the past decade various private and public groups have attempted to allocate the state totals among the counties of individual states.

Transfer payments are a part of personal income. They are defined as payments received by individuals for some reason other than because the recipients are engaged in current economic activity. The National Income Division prepares state data on 34 types of transfer payments but a few of them account for a large part of the total. Among the larger payments are: (1) direct relief; (2) veterans' pensions and compensation; (3) old-age and survivors' insurance; and (4) subsistence allowances to World War II and Korean veterans.

There are two basic methods of allocating state totals among the 77 counties. First, direct allocation involves the preparation of county data on a given type of transfer payment by the agency disbursing the funds. This is the ideal method of allocation. Second, indirect allocation consists of finding a statistical series closely related to a given type of payment so that it reflects the pattern of county distribution. Some indirect allocators are, for practical purposes, as satisfactory as direct allocators.

Data for directly or indirectly allocating transfer payments among the counties of Oklahoma are available in published and unpublished records of a wide variety of federal, state, and private agencies. The writer examined the available data for allocating each type of transfer payment. It was found that data are available for allocating 65 per cent of the dollar amount of total transfer payments among counties in a "highly satisfactory" manner. An additional 25 per cent may be allocated in a "satisfactory" manner. Data for allocating the remaining 10 per cent are generally unsatisfactory.

Total and per capita transfer payments were computed for the calendar year 1954. Per capita transfer payments for the state were \$108, about the same as the national average. Per capita transfer payments are relatively more important in Oklahoma than in the nation as a whole because total per capita personal income in Oklahoma is only about 80 per cent of the national average. Among the counties, per capita transfer payments were highest in the poorer eastern and southeastern counties of the state and were lowest in the rich, agricultural Panhandle counties.

235 pages. \$3.05. Mic 56-2136

THE EFFECTS OF OPEN INFLATION  
ON AGGREGATE CONSUMER DEMAND

(Publication No. 17,073)

Arthur M. Okun, Ph.D.  
Columbia University, 1956

This dissertation analyzes the effects of a general rise in product-prices on the total real volume of consumer expenditure. The way in which aggregate consumer demand responds to price increases is one important determinant of the character of the inflationary process. An inverse relationship between real consumption and the price level creates the possibility that inflationary pressure may be eliminated, and aggregative equilibrium restored, by a rise in commodity prices. Furthermore, a negative relationship between aggregate real consumption and the rate of increase of prices decelerates the speed of price inflation.

The literature of economics is replete with hypotheses which suggest a sedative influence of higher and/or rising prices on real consumption. A number of such hypotheses are studied: their potential stabilizing significance is examined algebraically; their theoretical foundations and behavioral implications are investigated; and their empirical validity is assessed quantitatively through the use of recent American time-series and cross-section data. Those hypotheses which receive principal attention are listed below, with a brief summary of findings.

**Hypothesis 1.** Consumers have inelastic price expectations, believing that prices will subsequently fall toward a "normal" level, and they therefore postpone consumption during inflation.

**Findings:** Theoretical reasoning and interview data lead to skepticism concerning the significance of price anticipations as a determinant of consumer spending. Insofar as expected price changes do exert an influence, it is likely to be destabilizing contrary to the hypothesis, since a current tendency for prices to rise is apparently extrapolated into the future by most households.

**Hypothesis 2.** Inflation depresses real consumption by reducing the real wealth of households.

**Findings:** Theoretical and empirical evidence confirm this proposition, which is known as the "Pigou effect." However, the quantitative estimates imply rather weak stabilizing influence. Under current conditions, an estimated 0.04% decline in real consumption would be attributable to the wealth effect associated with a one per cent increase in prices.

**Hypothesis 3.** Real consumer demand is inversely related to the rate of price increase because household spending depends on past, as well as current, earnings.

**Findings:** Of several possible lag relations between consumption and income, it is shown that one, denoted as the "budgeting lag," would act as a significant stabilizer during inflation. However, negative conclusions are obtained throughout in an empirical investigation and theoretical critique of the budgeting lag hypothesis.

**Hypothesis 4.** By altering functional distribution, inflation tends to increase the degree of inequality in the size-distribution of disposable income; consumption is thereby depressed because of the curvature of the propensity to consume schedule.

**Findings:** Quantitative estimates are presented regarding the probable decline in consumer demand associated with inflationary changes in the size-distribution of

income. The calculations agree with the proposition above in sign, but they are so small in magnitude that the conclusions regarding this hypothesis are, of necessity, essentially negative.

**Hypothesis 5.** Real disposable income is adversely affected by price increases and consequently aggregate real consumption is reduced.

**Findings:** This proposition is supported by compelling empirical evidence. Upon analysis, the decline in real disposable income is attributed primarily to the volatility of earnings before taxes in the corporate sector and to the allocation of incremental corporate earnings. It is estimated that, given a one per cent increase in prices, the loss of real disposable income produces a reduction in real consumption of approximately 0.16%. This clearly is the most significant among the depressants of consumption surveyed in the dissertation. Nevertheless, the stabilizing behavior of disposable income cannot be relied on to set a tolerable upper limit on the price level.

348 pages. \$4.45. Mic 56-2137

#### A CRITIQUE OF THE NATIONAL INCOME STATISTICS OF SELECTED ASIAN COUNTRIES

(Publication No. 16,292)

Harry Tatsumi Oshima, Ph.D.  
Columbia University, 1956

Nearly all of the Asian countries have published official national income statistics in the post-war years. It is the aim of this thesis to evaluate critically the accuracy of these estimates and to determine the uses to which they can be put.

The main characteristics of the Asian economic structure are small-scale family production for subsistence rather than for sale and a system of exchange which is principally local rather than national. The latter factor produces significant differences in real incomes in various parts of the economy, in contrast to a national market economy where there is a strong tendency toward the equalization of real incomes. These characteristics lead to various difficulties in the estimation of national income and expenditures in Asian countries. These difficulties are discussed with reference to the estimates of India, Japan, Burma, Ceylon and Malaya.

The analysis of these chapters indicate that the estimate of Japan, the most developed country in Asia, is the most reliable. The estimates for the other countries are subject to fairly large margins of error, despite heroic attempts by the national income staffs of the respective countries.

The estimates are too rough for a number of uses to which national income data are put in Western countries. Nevertheless, with certain reservations and considerable caution, they are useful for less precise purposes, some of which are most important for underdeveloped countries. These are planning for development, for public administration and finance, for revealing a correct sense of structural proportions of the economy, and others. For inter-country comparisons of structural proportions, for the comparative measurement of growth over time, for purposes of inter-

country comparisons of real incomes, these estimates must be used with great care.

In the final chapter, various suggestions are made for improving the statistical, methodological and conceptual bases of the estimates discussed. Although structural obstacles preclude the possibility of Asian estimates reaching a high level of accuracy in the near future, considerable advances can be achieved and the servicability of the figures enhanced. Toward this end, a number of suggestions are made.

380 pages. \$4.75. Mic 56-2138

#### ECONOMICS, COMMERCE-BUSINESS

##### THE RATIONALIZATION OF THE RETAIL DISTRIBUTION OF HOUSEHOLD HEATING OIL—A STUDY IN APPLIED ECONOMICS

(Publication No. 16,666)

Alfred Wilbur Swinaryard, Ph.D.  
Syracuse University, 1956

**Introduction.**--The use of household heating oil and of automatic oil burners has experienced a rapid growth since 1930. The gross margin available to petroleum bulk stations on household heating oil is low, averaging about 2 cents to 2 1/2 cents per gallon. It is, therefore, necessary for the distributor to make a careful study of his automatic delivery operations in order to achieve maximum efficiency.

**Objectives.**--This study is one of a series, conducted under the sponsorship of the Esso Standard Oil Company. The following major objectives were sought:

- I. To develop methods and techniques for improved analysis of the household heating oil delivery operation.
- II. To reveal actual delivery costs, cost trends and characteristics for important elements of the delivery process.
- III. To determine ways to develop a more efficient household heating oil delivery operation.
- IV. To provide information for training of company personnel and for dissemination to resellers of household heating oil so that the company and its distributors may obtain increased efficiency in the automatic delivery operation through improved training and allocation of resources devoted to the delivery of heating oil.

V. To achieve these goals while providing consumers of household heating oil an assured supply of heating oil at low cost.

**Method and Technique.**--The basic cost data were secured through time study techniques. Trained observers were assigned to tank truck drivers at a test plant. The drivers' activities were timed and recorded for all shifts during a two-week period, accounting for 447 hours of drivers' time, during which time trucks traveled over 2,000 miles and 1,026 customers were served. Direct and indirect delivery costs were allocated to major activities. Time cost and delivery data were punched in IBM cards and analyzed. IBM cards were also prepared for each delivery (11,672) made by the test plant during the 1950-51

heating season. Each card carried the necessary information to reconstruct the entire year's operation and analyze each step of the delivery process, including weather information upon which the customers' consumption of heating oil was estimated and trucks dispatched. An appraisal of alternative methods of calculation of the customers' consumption rate and seasonal variation was also made.

**Major Findings.**--The household heating oil delivery cost per gallon became less as the average size of the delivery increased. The two major factors influencing costs are the average size of delivery and the miles traveled. Based on a mathematically fitted regression, delivery costs are functions of quantity of oil delivered, size of truck, and location of the customer. Methods of minimizing delivery cost through more efficient dispatching and use of delivery cost information are developed.

The analysis of the method of calculation of household heating oil consumption rates indicates that a considerable saving can be made by more refined methods of accumulation of weather information and calculation of consumption rates. Existing methods used by the industry to correct for seasonal variation in consumption rates were found to be inadequate. The use of a separately calculated consumption rate for the Fall, Winter and Spring seasons for each individual customer gave evidence of achieving a larger size of delivery without any significant increase in the costs of running the automatic delivery system.

The cost and delivery analysis of the test plant indicates large savings can be made in the delivery of household heating oil. It appears possible for many retail distributors of household heating oil to double the net profit per gallon through more accurate forecasts of customers' heating oil consumption which will allow more efficient allocation of resources in the delivery operation.

299 pages. \$3.74. Mic 56-2139

#### SPECIFICATIONS AND COSTS FOR A MILK PASTEURIZING AND BOTTLING PLANT OF 6,400 QUARTS DAILY CAPACITY

(Publication No. 16,267)

Fred Clarence Webster, Ph.D.  
Cornell University, 1956

Chairman: Leland Spencer

This study is designed to develop specifications and analyze costs of an efficient milk pasteurizing and bottling plant equipped with the smallest automatic milk bottle filler commonly used. As this study is one of a series, the filler size was selected to fit in with the overall plan.

The procedure followed involves the preparation of detailed specifications, standards and costs for a basic synthetic plant operating at its practical capacity. The specifications and/or operating procedures are then modified and the effects of these changes analyzed. All specifications, labor requirements and other standards are based on previous empirical research and the advice of dairy specialists and management engineers with dairy plant experience.

The basic plant has a calculated practical capacity of 6402 quarts or 8376 packages of dairy products a day and

can be operated by a 5-man crew. At this level of output, total daily costs for plant operations, product shrinkage and packaging amount to \$194.32 or 2.32 cents per package of output. Of this amount, \$128.92 a day or 1.54 cents per package are for plant operating costs. Fixed plant costs amount to \$71.27 a day; variable costs at this level of output are \$57.65 a day.

It was determined that a 4-man crew can process a maximum of 5487 packages a day in this plant at a cost of \$108.22 a day or 1.97 cents per package (up 28 per cent) and that a 3-man crew can process 2323 packages a day at a cost of 3.37 cents per package (up 119 per cent). Approximation of costs at other levels of output involves adjustments for semi-fixed and semi-variable costs.

When the basic plant is modified to provide for pasteurization with a high-temperature short-time unit rather than in vat pasteurizers, requirements for floor space, steam, refrigeration and labor are reduced. The net saving in plant costs is \$3.67 a day.

When the basic plant is modified to package all products for sale to wholesale outlets in paper containers instead of glass bottles, plant costs increase by \$14.04 a day or 11 per cent. Packaging costs are increased by \$32.96 a day or 0.4 cent per unit of output. Increased costs in the glass-paper plant modification are the result of additional equipment, higher container costs and underutilization of packaging facilities.

When the basic plant is modified to receive all milk in bulk rather than in 40-quart cans, receiving costs are reduced by \$8.76 a day. Offsetting changes in the total plant operation limit net savings to \$5.53 a day or 3.9 cents per hundredweight of milk received.

Preliminary work on two other modifications of the basic plant indicates that (1) there is little advantage to cleaning equipment in place for a plant with this type of equipment and layout but (2) there is some advantage in processing milk 5 or 6 days a week instead of 7 if the plant is not operating at practical capacity.

In summary, one can make the following general observations. Under the conditions specified in this study, costs can be reduced by installing high-temperature short-time pasteurization or bulk milk receiving. Costs increase when part of the output is packaged in paper. Costs per unit increase as plant output decreases, but with notable discontinuities.

This study illustrates one method of applying well-established economic theory and accounting techniques to the practical problems of dairy plant operation. Proper analysis makes it possible to illustrate clearly the economic effects of scale, per cent of utilization, capitalization, various operating methods and other factors influencing costs.

160 pages. \$2.00. Mic 56-2140

## ECONOMICS, FINANCE

OPERATIONS OF THE RESERVE BANK  
OF INDIA (1935-1954)

(Publication No. 17,206)

Nalin I. Almaula, Ph.D.  
University of Pennsylvania, 1956

Supervisor: Dr. C. R. Whittlesey

This dissertation, as the title implies, attempts to evaluate the significance of the operations of the Reserve Bank of India. The main purpose is to trace the evolution and the effectiveness of the operations of a central bank based on the experiences of the American and the British central banks in an Indian setting.

To attain this objective a detailed examination is made of the instruments used by the Reserve Bank to achieve its policy aims. The scope of such an examination was considerably narrowed owing to the fact that apart from moral suasion, only discount rate and open market operations were employed by the Reserve Bank in carrying out its policy. Before delving into the use of these instruments, the setting in which the Reserve Bank has to operate is described. The first part of the thesis deals with the characteristics of the Indian banking system. It also describes the functions, organization and powers of the Reserve Bank. Efforts of the Reserve Bank to improve the structure of the Indian banking system by developing a bill market in India are covered in a separate chapter.

The conclusion emerges from the investigation that until the postwar years the Reserve Bank did not have much opportunity to assert its position. The main reason for the failure of the Reserve Bank to provide an active and effective leadership in the Indian money market in the first ten years of its career was the prevalence of easy money conditions throughout the period. Such easy conditions made it unnecessary for the banks to approach the Reserve Bank for assistance. But the conditions created by the partition of the country and especially by the outbreak of the Korean war enabled the Reserve Bank to assert its leadership in the organized sector of the money market. Banks came to depend more and more on assistance from the Reserve Bank in the postwar years. This is proved by the continuous rise in the figures for the advances and the discounts by the Reserve Bank during the postwar years. Even then there is need for strengthening the link between the Reserve Bank and the banking system. To achieve this purpose suggestions are made for the adoption of new instruments of control by the Reserve Bank.

After twenty years of the activities of the Reserve Bank in the country it is a fact that the unorganized sector is still largely out of the reserve system. The Reserve Bank should make more imaginative efforts than in the past to get the indigenous bankers on a par with the scheduled banks and thus help in the integration of the Indian money market.

246 pages. \$3.20. Mic 56-2141

AN APPRAISAL OF THE FEDERAL DEPOSIT  
INSURANCE CORPORATION

(Publication No. 17,040)

Leland Larson Beik, Ph.D.  
Columbia University, 1956

Chairman: B. H. Beckhart

Although previous state attempts to insure deposits were unsuccessful, banking losses in the early 'thirties brought about establishment of the Federal Deposit Insurance Corporation. The Corporation was created to help rehabilitate banking after the crisis of 1933. It has since operated in a prosperous era. A current appraisal of the Corporation and its position in the banking structure appears relevant after twenty years experience.

Deposit loss occurs when a failed bank's losses exceed capital and extend to depositor-creditors. Deposit insurance attempts to translate uncertainty of loss for individual depositors into expected loss for numerous depositors in many banks. Administrative expense and expected loss are distributed among a group of insuring banks to protect depositors in case of suspension.

The Corporation insured depositors to a maximum of \$2,500 (later \$5,000) under the temporary fund which began operations January 1, 1934. The permanent fund was established August 23, 1935. The Corporation is subject to supervision by Congress and now operates under the revised Federal Deposit Insurance Act of 1950.

Current insurance coverage is \$10,000 per depositor. About 54 per cent of deposits in insured banks and 98 per cent of accounts fall under this maximum. Deposit insurance is mandatory for member banks of the Federal Reserve System and voluntary for state nonmember banks. Over 94 per cent of banks of deposit are insured. The proved claims of depositors have been paid for all closed insured banks, and, where Corporation aid facilitated merger of a bank in difficulty, deposits have been protected in full. Banks may now be aided without the requirement of merger.

The Corporation is managed by its directors who are appointed by the President with the advice and consent of the Senate. The original capital stock had no voting privilege, and capital and interest on capital were later repaid the Treasury. The cumulative net income from assessments on insured banks became the deposit insurance fund or mutual capital of the Corporation.

Assessments on deposits and interest on investments provide income for the Corporation. A portion of assessments is now credited toward future payments whenever losses are not excessive. Income has paid losses and expenses to date. The fund has grown to about \$1.5 billion, and the Corporation may borrow \$3 billion from the Treasury.

Predicting experience of depositor loss is difficult because the risk of many bank suspensions in a short period is cyclical. Changes in business and banking also alter the probability of bank suspensions. Future depositor loss will reflect the influences of both cycle and trend. A depression as severe as that of 1930-33, however, would eliminate the existing fund, and the Corporation would have to borrow \$1.5 billion to insure loss. Payments to depositors before recoveries would most likely exceed fund and borrowing power.

The Corporation can meet a greater depression than it has experienced, yet the fund is not disaster proof. The responsibility of the federal government is technically limited to \$3 billion of Treasury loans. The apportionment of expected loss and emergency loss between the fund and government needs added definition.

Banks in difficulty have been helped to merge through loans or purchase of assets. This process prevents receivership and forced sale of sound assets. An adequate estimate of potential loss on such advances (with and without merger) is needed.

Banks are currently in strong condition, and accumulation of risk under unsound management is less likely with extended and improved federal supervision. In event of difficulty, deposit insurance will help provide an orderly market for bank assets and will help maintain public confidence.

293 pages. \$3.80 Mic 56-2142

#### A THEORY OF THE TERM STRUCTURE OF INTEREST RATES

(Publication No. 17,427)

John Mathew Culbertson, Ph.D.  
University of Michigan, 1956

This study attempts to formulate a theory of the term structure of interest rates which will represent a useful framework for realistic analysis, and to test this theory against rates for U. S. Government securities since 1920. The theory developed is that the maturity structure of interest rates on risk-free debt may be explained on the following basis:

(1) The superior liquidity of short-term debt commands a premium, which may vary with the general liquidity of investors and with the proportion of outstanding debt which is short term.

(2) Short-run shifts in the maturity structure of demand for funds may affect the term structure of interest rates by causing yield differentials which are based upon rigidities in the structure of supply of funds, as well as by affecting liquidity premiums and marginal lending costs on different types of debt.

(3) For riskless open market debt, differences in marginal lending costs related to debt maturity generally are small, though when the structure of demand for funds is changing, they may be significant.

(4) Speculative activity in debt (defined as that governed by specific expectations regarding debt prices and yields) is based mainly upon short planning periods, and is oriented principally towards expected developments for long-term debt, which shows the widest price fluctuations. Debt markets are not generally so dominated by unanimous speculative activity that any clear-cut relationship is to be found between maturity yields on debt of different maturities and market expectations as to future interest rate developments. Much investor and borrower behavior is not speculative, but is governed by a comparison of debt yields to maturity. It is because of the prevalence of such behavior that maturity yields on debt of all maturities usually move together.

Reflecting the combined effects of these factors, maturity yields on short-term U. S. Government debt since

1920 have averaged lower than those on long-term debt, and the two have generally moved simultaneously in the same direction, with short-term yields fluctuating over a much wider absolute range. During the early 1930's, short-term yields were unusually low relative to long-terms, mainly because of the sharp decline which occurred in the relative amount of short-term debt outstanding, and of other factors which tended to increase liquidity premiums.

The major implications of the argument of the study are the following: (1) Analysis of the liquidity position of the economy should take account not only of the supply of money, but also of availability of other assets capable of filling liquidity needs. In this connection, changes in the maturity structure of outstanding debt may be important. (2) Realistic analysis of speculative behavior, in debt markets and elsewhere, must take account of the variety of patterns of speculative activity which exist as a result of differences in the length of speculative planning periods--which need bear no relationship to the life of the asset dealt in--and other factors. (3) Government credit and debt management measures, particularly during periods in which strong action is required, should be planned as parts of an integrated credit-debt policy. This policy should be guided by the appropriateness to the needs of stabilization of the liquidity situation of the economy, the general terms of availability of credit, and the state of balance between the maturity structure of demand for and supply of credit. It may be appropriate to increase the proportion of U. S. Government debt which is short-term during deflationary periods and to decrease it during periods of inflationary danger.

262 pages. \$3.40. Mic 56-2143

#### DEVELOPMENT OF COMMON STOCK INVESTMENT MEDIA IN THE UNITED STATES

(Publication No. 16,951)

Theodore Sidney Kliston, Ph.D.  
The American University, 1956

It is the author's thesis that the recent development and rapid growth of the various forms of common stock investment media, such as personal trust funds (including common trust funds), mutual funds, pension funds, closed-end investment companies, investment clubs, endowment funds, and non-life insurance companies, as well as the movement to legalize variable annuity companies, are evidences of revolutionary changes taking place in the methods of seeking financial security, as well as of important changes taking place in the securities markets. He further believes that these revolutionary changes are the financial counterpart of the general socio-economic revolution of the past few decades, being a consequence of events taking place in the world today.

It is the basic objective of this study to show that the modern common stock investment medium is a financial and social invention brought into being and developed to perform specific functions in a specific socio-economic environment. Basically, it is a device whereby an increasing number of individuals may provide themselves with an additional form of financial insurance not directly included in the Government-prescribed social insurance programs,

and not otherwise generally available. As such, this device is in accord with a capitalistic society dominated by a compulsory individual assumption of most economic responsibilities.

This study will seek to show that the development of the common stock investment medium is a result of many causes, including the widespread demands by persons of moderate means for protection against the hazards of inflation and for fuller participation in the financial prosperity arising from America's industrial growth. Above all, there is the present inability for large numbers of persons and families of moderate means to provide adequately from their own resources for such economic and social risks as old age, disabilities, and unemployment in an economy characterized by increasing prices and a decreasing purchasing power of money.

As will be discussed, these changes that are now taking place are of great consequence to the securities markets and the stock exchanges. If the thesis is accepted, there are many more changes that can be expected.

#### PROCEDURE, OR METHODS

The study first proceeds to analyze the major pertinent forces believed to have been responsible for the creation and rapid growth of the common stock investment media in recent years. These are identified and their influence noted. This portion of the study comprises Part B.

Part C is devoted to an analysis of the various forms of common stock investment media, tracing development, the major factors involved in limiting and encouraging past growth and future growth possibilities, and noting such other factors as seem to pertain to the particular subject area of the thesis. Comparison is also made of the suitability of the various types of common stock investment media as instruments of investment for persons of moderate incomes seeking security objectives, largely as a corollary to the analysis of the factor of growth and the forces helping to create, or limit, growth.

Introduction and analysis is then made, in Part D, of the newest form of common stock investment medium, the variable annuity. Special emphasis is given to this subject, both because of the tremendous potentialities of variable annuities and because the creation of this newest form of common stock investment medium seems expressive of the forces currently active in the field of investment media.

Part E consists of the conclusions.

Primarily, this thesis is an attempt to integrate relevant expert ideas, research ideas, research findings and historical references into a philosophical discourse of the investment medium field. This method has been variously described, some social scientists in recent publications titling it as the "sociology of knowledge."

#### RESULTS

The study indicates the author's thesis is justified, for reasons enumerated in this study.

#### CONCLUSIONS

There is a dynamic movement toward stock investments by the financial institutions, and a movement toward the accumulation of savings by individuals through the medium

of the financial institutions. These movements are influencing the practices of the securities markets and the outlook for investment institutions, in ways that are described in the study.

360 pages. \$4.60. Mic 56-2144

#### INCOME CHANGES IN THE VARIOUS STATES OF THE UNITED STATES: A SECULAR AND CYCLICAL ANALYSIS

(Publication No. 16,338)

Richard Blaise Maffei, Ph.D.  
University of Pennsylvania, 1956

Supervisor: Donald S. Murray

#### Statement of the Problem

This study had two broad objectives: (1) to study the secular and cyclical characteristics of the state income payments data, adjusted for price changes, during the period from 1919 to 1949 and (2) to interpret hypotheses suggested by the descriptive analysis by utilizing data that related to state by state age distribution patterns, wage and industry patterns, migration patterns and urbanization indices.

Historical facts supplied a working hypothesis: Differences in the levels and rates of change of levels of per capita real income among states were associated with changes in the industrial structures of the states over the period of interest.

#### Procedure

At the outset, a rather detailed study was made of the income aggregate. Then, a study was made of the characteristics of the Consumer Price Index and the Index of Prices Paid by Farmers for Household Living. After the income and expenditures side of the deflation problem were considered, an adjustment for industrial structure was made, and then the income series were deflated.

The secular levels were defined as cycle standings, using the NBER chronology of reference cycles. Cycle characteristics were studied by taking the annual estimates and relating them to the appropriate secular levels. Secular levels for per capita and total real income estimates were calculated for each state and for all regular and inverted reference cycles during the period from 1929 to 1949. Similar estimates using Leven's data were made for the 1919 to 1921 cycle.

#### Conclusions

1. There was a progressive narrowing of relative differences in per capita real income from 1919 to 1949, among states, although the evidence indicates that there was no decrease in absolute differences.
2. The decrease in relative differences among state per capita income levels was accompanied by increased urbanization and increased non-agricultural activity during the period.
3. The persistent tendency toward increased industrialization combined with persistent differences in agricultural and non-agricultural wage rates accounted in large

- measure for differences in the rates of growth of per capita real income among states.
4. Adjustments for age structure differences and industrial structure differences helped to explain away differences in the levels of per capita real income among states.
  5. States with diversified activity and with high per capita incomes appeared to be more stable cyclically and secularly than did states with more simply structured economies.
  6. There was a tendency toward similarity (at the given level of aggregation) of industrial structures during the period that could be attributed in part to increased mobility of economic resources.
  7. The narrowing of per capita income differentials implies that the income yielding activities among space locations are becoming equally productive of per capita income.
- 263 pages. \$3.29. Mic 56-2145

#### THE COST BASIS IN BUSINESS COMBINATIONS

(Publication No. 17,075)

Garland Chester Owens, Ph.D.  
Columbia University, 1956

The present wave of business combinations in the United States has created many social, economic and accounting problems. One of the basic accounting problems is to determine the proper carrying-value of assets acquired or involved in various types of ownership changes. The carrying-value of a company's assets is important because it provides the basis for subsequent measurements of income.

Concerning the basis at which assets acquired or involved in business combinations should be stated, Accounting Research Bulletins, No. 40, states "When a combination is deemed to be a purchase the assets purchased should be recorded on the books of the acquiring company at cost.... When a combination is deemed to be a pooling of interests, the necessity for a new basis of accountability does not arise. The book values of the assets of the constituent companies...should be carried forward."

Since assets are normally recorded at cost, the problem in business combinations is (1) to determine cost when various types of ownership changes occur, and (2) to determine if a business combination is an occasion which permits or requires a departure from cost.

In a purchase of assets, in a purchase of stock, in a pooling of interests, various types of ownership changes occur. The change of ownership may be a complete change of direct ownership as in the case where one company acquires the assets of another, whether for cash or its equivalent, or for shares of stock. In other cases, the change of ownership may be a complete or substantially complete change of indirect ownership as in the case where one company acquires the outstanding stock of another, whether for cash or its equivalent or for shares of stock. In other cases, the change of ownership may be a partial change of direct and indirect ownership as in the case of a pooling of interests wherein the assets and businesses of two or more companies are combined in a surviving company. The significance of these changes of ownership lies in the basis of

accountability for the assets which is established as a result thereof.

This study consists of five chapters. Chapters I and II explain the problem, its social environments, and its im-pingements on public and social policy. Chapter III deals with accounting procedures applicable in complete changes of direct ownership (purchase of assets) and in complete, or substantially complete, changes of indirect ownership (purchase of stock). In Part A, case materials are presented which illustrate the procedures currently used in measuring accountability for assets acquired in business combinations that result in a complete, or substantially complete, change of direct or indirect ownership. In Part B, an analysis and evaluation of the procedures discussed in Part A are given. Chapter IV deals with business combinations of a pooling of interests type wherein there is a partial but significant change of direct and indirect ownership. In Part A, case materials are presented which illustrate the relationship of book values and current values among assets being pooled in business combinations. In Part B, an analysis and evaluation of the principles underlying the case materials presented in Part A are given with special emphasis on the change of ownership that occurs in a pooling of interests, and the impairment of book value as a measure of corporate accountability which results from these partial changes of ownership. The study revealed several cases wherein a restatement of assets (upward) and a "fresh start" through the procedure of a quasi-reorganization would produce more useful results. Chapter V contains the summary and conclusions.

243 pages. \$3.15. Mic 56-2146

#### STUDY OF THE RELIEF PROVISIONS OF SECTION 722 OF THE EXCESS PROFITS TAX LAW OF WORLD WAR II

(Publication No. 16,910)

Goldie Stone, Ph.D.  
Columbia University, 1956

Section 722 was the general relief provision of the excess profits tax law of World War II. This provision was the means for granting to qualified taxpayers a new credit for the excess profits tax. This section of the law represented the first time that economic factors had been written into the tax law. The study analyzes the experience with the section with emphasis upon the economic implications.

The development of section 722 is traced from the Congressional Committee hearings through the writing of the law. The administration of section 722 was of great importance as the law permitted substantial discretion to the Commissioner of Internal Revenue in the establishment of the taxpayer's credit. For this reason, a full discussion of the development of the administrative framework has been included.

For comparative purposes and for showing the evolution of general relief, the general relief provisions of World War I and of the Korean War have been analyzed. General relief in 1917 and 1918 was based upon the use of data on comparative corporations; in 1940 to 1945, section 722 relief was allocated on an individual basis through the

construction of an estimated income which was based upon the company's unique experience and was substituted for actual 1936 to 1939 income; in 1950 to 1953, general relief was allowed under definite rules with the substitute income computed under a formula which was applicable to all companies. General relief moved from the extremely general to the highly specific. To place all of these provisions for relief within a proper frame, the excess profits laws are also discussed.

The analysis of the subsections of section 722 is based upon the regulations, rulings, and other publications of the Treasury Department, the memoranda and publications of the Excess Profits Tax Council, and the reports of the cases before the Tax Court. The cases decided by the Tax Court provided the most information on the reasons for application for section 722 relief. Analysis of the 148 cases that were decided in the Tax Court to June 30, 1955 is the major portion of the study.

There were five bases for relief available to corporations computing the excess profits tax credit upon either the income or invested capital base: depression in base period income due to unusual and peculiar events; depression due to temporary and unusual economic conditions; depression due to variant profit cycle or sporadic high profits; commencement or change in character of business, and any other factor affecting income. The most important, upon the basis of the number of applications for relief and receipt of relief, and the amount of discussion was the change in character. The three bases for corporations restricted to the invested capital base were: important income-producing intangible assets not includable in invested capital, capital not an important income-producing factor, and invested capital abnormally low. The first of these factors proved to be the most important.

Since an excess profits tax upon corporate income is regarded as an integral part of the mobilization of all resources of the country for a war, a provision in the law of the section 722 type is regarded as necessary. It provided relief to a company with base period income inadequate due to conditions, physical or economic, external to the firm, to a company in the process of an important change whether in product, operation, production, or capital, to a company in an industry (defined relatively narrowly) which was depressed during the base period, and to a new company with an inadequate invested capital base.

Any new law should cover all these conditions and should provide for a semi-autonomous board to administer the law. The section should not be circumscribed by specific number qualifications as was the 1950 law. The excess profits tax law should have a minimum credit in order to eliminate the need for relief by relatively small companies.

The record of section 722 relief was initially marred by cursory taxpayer applications and by cautious Bureau decisions. After both early difficulties were eliminated, the relief under section 722 became meaningful. Section 722 did accomplish the purpose of the writers of the law, within the limitations of the language of the statute.

1032 pages. \$12.90. Mic 56-2147

## ECONOMICS, HISTORY

### THE MERCHANT IN VIRGINIA, 1700-1775

(Publication No. 16,217)

Robert Polk Thomson, Ph.D.  
The University of Wisconsin, 1955

Supervisor: Professor Merrill Jensen

Virginia's small population was centered near navigable water in 1700. This enabled the planters to consign their commodities, mostly tobacco, directly to England and to buy their European goods there. Their English factors, the consignment merchants, dominated the Virginia trade. Only a few storekeepers and West India traders could claim the title "merchant" in Virginia.

After 1720, Virginia's territorial expansion drastically changed the character of her economy. Settlers occupied the Piedmont, the South Side and the Valley. Virginia's population doubled and redoubled. She produced vastly greater quantities of tobacco than ever before, and became a significant producer of grains, naval stores, lumber and meat products, and miscellaneous commodities. Her enlarged population needed huge supplies of goods from Great Britain and the West Indies.

The Piedmont expansion created both problems and opportunities. Planters who lived far from navigable water could not conveniently deal with London consignment merchants, and they produced commodities not suited to the consignment trade. Local merchants who attempted to capture this new market made some progress, but they had neither the capital nor the ability necessary for large scale enterprise. The government, in an effort to assist both the merchants and planters, enacted laws calling for the inspection of many exportable commodities, including tobacco; laws to encourage the building of towns; laws governing contractual relations between merchants and planters; laws restricting the activity of undesirable trades such as peddlers; laws regulating the building of roads and clearing of streams; and laws for the establishment of adequate local government.

The real possibilities of commerce in Virginia were first realized by Scottish merchants. These merchants came to Virginia in large numbers after 1707. By means of aggressive trading practices they succeeded in dominating the local trade of the colony. They established chains of stores, sold goods both wholesale and retail, and bought tobacco and other commodities directly from the planters. Soon they sold most of the European goods imported into Virginia and made Glasgow a tobacco port that rivaled London in eminence.

By mid-century both English and native Virginia merchants had begun to emulate Scottish business practices and Virginia entered a period of widespread mercantile activity. Virginia's businesses included exporters and importers, wholesale houses, retail chains, local retail stores, professional tobacco buyers and debt collectors. While most of the important firms were operated by Scottish or English factors, these factors were often partners in their concerns and were astute businessmen. Some of them adopted Virginia for their permanent homes and operated their own business ventures.

The merchants and their businesses suffered serious setbacks in the decade that followed the close of the French and Indian War. The depression of the early 1760's was accompanied by serious monetary problems in Virginia and was followed by a prolonged series of crises. The Stamp Act debate, the non-importation movement of 1769-1771, the bank crisis of 1772-1773, and the non-importation movement of 1774 strained Virginia's commerce to the breaking point. Worn out by the unrelenting misfortunes, most of the British factors abandoned the colony at the beginning of the Revolution. The mercantile system was Virginia's first Revolutionary casualty.

416 pages. \$5.20. Mic 56-2148

#### ECONOMICS, THEORY

##### THE ECONOMICS OF FUNCTIONAL PRICING

(Publication No. 17,105)

Clinton A. Phillips, Ph.D.  
Vanderbilt University, 1956

Supervisor: Professor George W. Stocking

This study deals with cases instituted by the Federal Trade Commission against firms that charge different prices to buyers in different customer classifications. In these cases the Commission has developed and applied a legal theory that conflicts with economic theory. This study seeks to illuminate the conflict through a survey of the historical development of functional pricing and economic analyses of cases in which functional pricing has been at issue.

The central problem in these cases concerns firms that fall into two or more customer classifications. Cases involving these so-called split-function firms are of two types. First, in many industries sellers charge two or

more prices to certain of their distributor-customers because the latter in turn resell to two or more levels of trade. There appears to be no economic justification for this practice. Sellers who are able, discriminate in this manner to protect the so-called "orthodox" channel of distribution and thereby protect the resale price structure of their industry. Such a practice survives only as long as integrated customers remain weak, unable to bargain for more favorable treatment.

The Federal Trade Commission has dealt with this problem by ordering sellers that charge their split-function customers two prices to make certain that these customers in fact resell in the proportions in which they allege they resell. To comply, these sellers must "supervise" their customers' business. But this may require them to engage in resale price maintenance. This study concludes that orders such as these that further rigidify existing market structures are inconsistent with our antitrust policy of preserving and promoting competition.

The second type of split-function case is illustrated by the pricing practices in the spark plug industry. Here the dominant sellers charge low prices to automobile manufacturers for spark plugs which the latter install in new automobiles and prices three or four times higher for plugs that the latter resell through their dealers as repair plugs. These spark plug companies charge their own distributors even higher prices for repair plugs. The amount of discrimination involved is substantial.

Because the prestige of having original equipment business strongly influences consumers to buy the same brand of replacement plug, the dominant spark plug producers use this two-price system to insure for themselves the original equipment business of the automobile companies. The facts indicate that their use of the two-price system not only discriminates among original equipment and replacement plug purchasers, it also has the effect of excluding smaller rivals from the original equipment market.

In these cases the Commission has found that the spark plug producers' use of the two-price system does not injure competition because original equipment plugs and replacement plugs are not sold in competition with each other. This study concludes that such reasoning conflicts with economic logic and therefore is not consistent with sound public policy.

329 pages. \$4.25. Mic 56-2149

## EDUCATION

### EDUCATION, GENERAL

#### THE RELATIONSHIP BETWEEN PARTICIPATION IN STUDENT ACTIVITIES IN CERTAIN NEW YORK STATE HIGH SCHOOLS AND LATER CIVIC AND SOCIAL PARTICIPATION

(Publication No. 16,995)

Fred Augustus Bennett, Ph.D.  
Cornell University, 1956

Although many values to both society and the individual have been claimed for the student activity program in high schools, there has been little research to show to what extent these values are actually achieved from participation in such activities. This study proposed to determine whether there was any positive relationship between participation in student activities in five New York State high schools and later participation in community civic and social affairs.

Each graduate of the classes of 1945-49 in Fulton, Gloversville, Hastings-on-Hudson, Ithaca, and Lockport was ranked according to the extent of his participation in high school student activities. The highest and lowest quartiles of such ranking were contacted by questionnaire to determine the extent and nature of their present community participation. The replies from those who had been active in student affairs and from those who had not participated in student activities were compared.

Such comparison revealed that participants and non-participants are equally likely to be married; both groups report that they vote equally well, and almost always, in general elections. Those who participated in school activities are more likely to have moved away from the community where they attended high school, although this mobility does not affect community participation. Participants are more likely to have entered the professions, to have held military commissions, and to be active in church, service clubs, social, sports, and miscellaneous community organizations. Girls who were active in high school affairs are more likely to be simply homemakers. A higher proportion of non-participants have been in military service, and are now active in patriotic, veterans', and lodge affairs in the community where they are living.

The study showed that, as a group, active participants in high school activities are fifty percent more likely to be active in community affairs than are non-participants. There is an even more definite relationship between student participation and later leadership in community organizations. Social participation is a family characteristic; those who were active in high school affairs tend to marry persons who will join with them in community organizations. It is the female participation in community activities which determines the superiority of the group who have been active in high school affairs. Among all occupational groups, teachers participate most extensively in community activities, with skilled labor and the managerial classes also having comparatively high participation scores. Homemakers, as a group, are more active than the average occupational group.

In these five high schools there was no scholastic limitation on participation in activities. Such participation did not impair scholastic achievement. There was, instead, a low to moderate positive correlation between scholastic rank and the extent of such participation.

There is little relationship between the extensiveness of the activity program offered by an individual school and the likelihood of its participants engaging in community activities. A moderately extensive, varied, balanced program of activities produces the greatest contrast in extent of community activity, between participants and non-participants.

192 pages. \$2.50. Mic 56-2150

#### THE CURRICULUM AND VOCATIONAL CHOICES OF 250 ENTERING FRESHMAN ENGINEERS AT THE PENNSYLVANIA STATE UNIVERSITY, 1954-1955

(Publication No. 16,704)  
James W. Dean, Ed.D.  
The Pennsylvania State University, 1956

##### Statement of the Problem

What were the reasons for the selection of curriculum and vocation by 250 freshman men entering The Pennsylvania State University in September 1954? Attention was given to the academic and personal progress as basis for total adjustment. The research has tried to determine if there are certain weaknesses within the instructional and administrative programs that long range planning may correct or improve.

##### Summary of Procedures

The population studied included 250 freshmen enrolled in the engineering curriculum for the academic year 1954-1955, 30% of the total freshman engineering class of 831 men as of November 1, 1954.

Three student questionnaires were developed for distribution throughout the school year. The questionnaires were distributed in November 1954, January 1955, and in May 1955 by the following methods: the first questionnaire was given to the freshmen by the graduate resident counselors living in the campus residence halls; and the second and third questionnaires were distributed personally by the author to permit individual observation and personal interview with each of the men in the study. The scores of the Group II section of the Strong Vocational Interest Test for Men were tabulated, and the results were used as an evaluation of the interest scores and the ratings of the University for the 52 freshman engineers who withdrew from the University during the academic year.

##### Summary and Conclusions

The study revealed that 45% of the freshman engineers studied finished in the upper 1/5 of their high school graduating classes and that 83% were in the upper 2/5; 79% of

the freshmen had followed the academic or college preparatory curriculums in high school; 36% of the freshmen came from high schools with enrollments of 100 to 500 students; 31% of the men selected their intended vocations in the 12th grade of high school; and 42% chose their college curriculum in the last year of high school.

By use of objective check-ratings of the University at three different times during the freshman year, the research revealed that the students' evaluations changed toward a dislike of the University as the school year progressed. The Chi-Squared statistic of relationship among the estimates of the University at three different times was significant at the .02 level. There appeared to be a relationship between the feelings for the University and the length of time spent at the school.

Subjective reasons for liking and disliking the University at three different times during the year followed a trend: at the end of the first year, 25% of the freshmen disliked their instructors; 28% disliked the academic grading system; and 37% gave reasons for liking the University, while 62% gave reasons for dislike.

The study revealed that 52% of the freshmen participating in the study ranked in the A group of the Group II scores on the Strong Vocational Interest Test for Men, and 31% ranked in the B group. Since groups A and B indicated a high interest relationship with all successful men in the engineering fields, this study shows that 84% of the students in this study ranked high in relationship with other men in the engineering profession. There was a higher proportion of drop-outs in the C groups.

The freshman engineers depend on fellow-freshmen and upper-classmen with some help from graduate resident counselors for most of their advice in adjusting to college during the first year.

Most of the drop-outs during the freshman year were associated with financial difficulties, poor grades, and a general dislike for the University. Low Strong Vocational Interest Scores are more common in the drop-out groups.

#### VITA

James W. Dean was born September 17, 1920 in McKeesport, Pennsylvania. He attended elementary and secondary school in McKeesport, graduating in 1938. He entered the United States Air Force in 1942 serving as a flying officer with the Flying Tigers of the 14th Air Force in China and Burma. He received the Silver Star, The Distinguished Flying Cross with one oak leaf cluster, The Air Medal with three oak leaf clusters, and the Purple Heart. In September 1945 he entered Grove City College and received a B.A. degree in January 1949. He received his M.A. degree from Bucknell University in August 1950. He served as Guidance Director and Assistant Principal at Midland, Pennsylvania, High School from 1949 to 1953; Assistant Dean of Men at The Pennsylvania State University, 1953-1955; and Dean of Students at Coe College, Cedar Rapids, Iowa, 1955. He received the Doctor of Education Degree from The Pennsylvania State University in January, 1956.

116 pages. \$1.50. Mic 56-2151

#### AN ANALYSIS OF INVENTORY SYSTEMS FOR EXPENDABLE SUPPLIES IN INDUSTRIAL ARTS, WITH RECOMMENDATIONS FOR A SIMPLIFIED PERPETUAL INVENTORY SYSTEM

(Publication No. 16,707)

William H. Etsweiler, Jr., Ed.D.  
The Pennsylvania State University, 1956

#### Introduction to the Problem

The financial management of an industrial arts program represents a phase of school accounting which requires reliable and accurate records. The number and kind of school records kept are somewhat determined by the administrative policy of the district. Hence, this study was designed to analyze the several inventory systems for expendable industrial arts supplies used by administrators and industrial arts teachers of selected third and fourth class school districts in Pennsylvania, and to make recommendations for a simplified perpetual inventory system, based upon the findings of the study.

#### Procedures of the Study

A bibliography for study was developed from a search of the literature in the field under investigation. From the study of the literature, personal interviews, and other related sources, a list of 20 inventory criteria was formulated. These criteria were validated by a limited number of specialists in fields related to the study. The validated criteria were used in a questionnaire designed for industrial arts teachers.

A survey of 296 industrial arts teachers, representing every county of Pennsylvania, exclusive of Philadelphia County, was conducted for the purpose of analyzing current inventory practices.

#### Findings of the Study

The percentage of industrial arts teachers who believed they should use the validated inventory criteria far exceeded the figure representing the teachers who actually used the criteria in their practice of keeping inventory records.

Twelve of the original 20 criteria items represented the first 10 criteria as ranked in order of importance by the validation juries, and the first 9 criteria as ranked in order of importance by the industrial arts teachers. The proposed simplified perpetual inventory system was based upon these 12 highly-correlated criteria:

Provide for an annual inventory of supplies.

Classify all expendable supplies, i.e., Hardwoods, Ferrous Metals, Abrasives, Welding Supplies.

Furnish an index of all classified supplies.

Indicate quantity of each item to be ordered.

Include brief but adequate specifications with each item to be ordered.

Provide a current cost record per ordering unit.

Maintain a record of back-ordered items.

Provide a record of receipts of supplies.

Arrange in a manner so as to provide for inclusion of new classes of supplies.

Provide for subdivisions of all classified index material as necessary for individual items.

Provide space for including names of reliable vendors of each class of items.

Include a record of dates when orders are placed.

### Recommendations

A system of accounting for expendable industrial arts supplies should be introduced into the industrial arts programs in the public schools of Pennsylvania.

School administrators should encourage the use of a simplified perpetual inventory system by allotting ample time to the industrial arts teachers for maintaining inventory records.

A standard inventory record form for expendable supplies should be endorsed and provided by the Vocational Division of the Department of Public Instruction for use in the industrial arts programs in the public schools of Pennsylvania.

### VITA

William H. Etsweiler, Jr. was born June 14, 1919 at Millersburg, Pennsylvania. Secondary education was received at Millersburg, Pennsylvania; Bachelor of Science at State Teachers College, California, Pennsylvania, 1937; Master of Science at The Pennsylvania State College, 1949.

Teaching experience: Industrial arts at Huntingdon Area High School, Huntingdon, Pennsylvania and the Brentwood, Irwin, and Susquehanna Township High Schools.

Military experience: 1943-1946 with U. S. Naval Construction Battalions; 1950-1952 recalled to active duty with U. S. Navy.

He received the Doctor of Education degree at The Pennsylvania State University, January 1956. He is a member of Phi Delta Kappa, Iota Lambda Sigma and Epsilon Pi Tau.

126 pages. \$1.58. Mic 56-2152

### THE EFFECTIVENESS OF A MATHEMATICS REVIEW COURSE FOR FRESHMEN IN THE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

(Publication No. 15,619)

Harrison Adam Geiselmann, Ph.D.  
Cornell University, 1955

In each of three fall semesters, during the years, 1952-1955, the investigator taught an applied mathematics of agriculture course to an experimental group of 150 freshmen in the College of Agriculture at Cornell University. The purposes of the course were to review the high school mathematics in which the students demonstrated weaknesses, and to teach the mathematics needed in subsequent courses. The purpose of the investigation was to ascertain longitudinally the effectiveness of the mathematics course.

Each year, the experimental group consisted of a random sample of the male agricultural freshmen in the lower 80% of the class, as determined by scores on the Cornell Mathematics Test, (125 four-year and 25 two-year freshmen). The control group consisted of the remaining male freshmen in this category, (125 four-year and 75 two-year freshmen).

Following are the hypotheses studied, together with the respective statistical techniques used in testing these hypotheses:

(1) The experimental and control groups do not differ with respect to subsequent achievement, as measured by:

- (a) Cumulative grade-point averages for six semesters.
- (b) Final marks in Chemistry 105 and 106 (sequence for students in scientific curricula).
- (c) Final marks in Chemistry 101 and 102 (terminal sequence).
- (d) Final marks in Agricultural Engineering.
- (e) Final marks in College Physics.
- (f) Final marks in Analytic Geometry and Calculus. (Analysis of covariance technique).

(2) Students in the experimental group and students in the control group do not differ in their tendency to remain enrolled in the College of Agriculture. (Chi-square technique).

(3) Freshman students in the experimental group and freshman students in the control group do not differ in their gains in mathematical knowledge at the end of the second semester, as measured by the Cornell Mathematics Test. (Analysis of variance technique).

(4) The majority of the students who completed the experimental mathematics course did not react to it favorably. (Questionnaire evaluation).

Hypothesis (1) was generally confirmed, with the exception of two instances. The first of these occurred in Chemistry 105 achievement, in which the experimental group significantly surpassed the control group. On the other hand, the control group significantly exceeded the experimental group in Chemistry 102 achievement. This second result may have been caused by the higher attrition rate of the control group in the first semester. Further stratification of Hypothesis (1) into categories of better and poorer students, as defined by their high school grade-point averages, resulted in two significant differences. In Agricultural Engineering, the better students in the experimental group significantly exceeded the better students in the control group. In Chemistry 102, the poorer students in the control group significantly surpassed the poorer students in the experimental group.

Although the experimental group demonstrated a significantly lower attrition rate by the end of the first semester, the trend was reversed at the end of the second semester, so that the cumulative attrition rate was non-significant from the second to the sixth semesters. Hence, Hypothesis (2) was generally confirmed.

The experimental group demonstrated a higher mean gain on the Cornell Mathematics Test than did the control group, the difference being significant at the 1% level of confidence. Therefore, Hypothesis (3) was refuted.

Hypothesis (4) was generally refuted, since nearly 70% of the students in the experimental group were in favor of continuing the course for freshmen in the College of Agriculture.

Hypotheses (1) and (2) were investigated separately for the two-year students, but no significant differences were found between the experimental and control groups.

The evidence suggests that the general review course was more beneficial to the better students than to the poorer ones. Hence, it is possible that a more effective arrangement would have been the inclusion of two different courses, or two levels of courses, with more provisions made for individual diagnosis and remediation in the case of the poorer students. In this experiment, the chances of demonstrating the effectiveness of the mathematics course

would have been improved by comparing the experimental and control groups on achievement in mathematical problems occurring on examinations within a particular course. Then, the criteria would have been more nearly measurable as actual mathematical achievement.

366 pages. \$4.58. Mic 56-2153

#### EDUCATIONAL IMPLICATIONS OF POPULATION CHANGE IN SOUTH CAROLINA

(Publication No. 16,965)

James McMakin Gibert, Ph.D.  
University of South Carolina, 1956

Major Professor: Dr. Newton Edwards

As South Carolina has moved from an essentially agrarian economy toward a more complex industrial economy there have been significant changes in the population. The purpose of this study is to analyze some of these changes and to appraise their significance for educational policy.

The demographic phase of the study includes analyses of five aspects of the population: (1) growth and distribution, (2) occupational distribution, (3) differential fertility, (4) migration, and (5) age and sex distribution. Analyses are made of each aspect with respect to rural and urban elements of the population, to white and non-white racial groups, and to geographic areas and counties. Each of the five aspects is related to the others, and all appear to have been influenced by such economic and social characteristics as financial status, levels of living, and educational attainments.

Data to show that the recent history of the State has been characterized by demographic change are numerous and conclusive. In the first half of the twentieth century, the white population has more than doubled; growth of the non-white population has been slight; pressure of the population on the resource structure has caused net losses due to out-migration to be very large, especially from the non-white population; the occupational pattern has shifted away from agriculture and toward manufacturing and transportation, trade, and service industries; urban settlements have become larger and more numerous; fertility of the population has been among the highest in the nation; the mean and median ages of the population have risen fairly steadily — these and other population changes have affected the educational problems of the State and its communities.

Findings in the part of the study directly concerned with education indicate that due to high fertility and the out-migration of adults the educational load of South Carolina has been heavier than that of any other state for several decades. Non-white and rural elements of the population have always borne disproportionately large numbers of children. In terms of income, levels of living, and educational attainment — these are the population elements least able to bear the burden of rearing and educating children. Although the State has assumed a large share of the educational burden, there was in the early nineteen-fifties some reliance upon local property taxes for school support. Moreover, there were significant differentials in educational opportunities offered in different areas and

among different segments of the population. These differentials are reflected in analyses of income and expenditures for school purposes, status of teachers, enrollment and attendance, and educational attainments of adults.

Other educational data show that during the current decade, despite an increase in the total number of children, the ability of the State to support education has been greater than ever before. This increase in ability is indicated by reduction in the ratio of children to adults, rising levels of income, and increase in ability to pay taxes.

Implications are drawn from the analyses of demographic and educational data that indicate need for increasing the level of general education in the State and need for changes in the educational programs to adjust to economic and demographic changes. Some of the types of needed educational changes include provision of psychological and occupational education for the aged, education for the use of leisure time, education in resource use, training for adults who must make vocational adjustments, orientation and education of migrants, and generalized vocational training for youth.

Throughout the study are indications that changes are in progress. Further research based on data that will become available in the decade of the nineteen-sixties may provide perspective to the demographic scene in the State.

249 pages. \$3.25. Mic 56-2154

#### GENERAL EDUCATION IN THE SPRINGFIELD, MISSOURI, JUNIOR HIGH SCHOOLS

(Publication No. 16,938)

Milford Owen Holt, Ed.D.  
University of Colorado, 1955

Supervisor: Associate Professor Stephen A. Romine

The purpose of this study was to develop materials which could be used to effect an improvement in the General Education program of the Springfield, Missouri junior high schools. General Education is a term used in the Springfield school system for a two period core class which includes social studies, language arts, and literature.

The materials developed in this study were of four types: (1) A scope and sequence outline, (2) Suggestions for implementing the scope and sequence outline, (3) Resource units to be used in implementing the scope and sequence outline, and (4) Suggestions for evaluating the program.

The scope and sequence outline indicated social studies content, social studies skills, and language arts skills for each of the grade levels of the junior high school.

The suggestions relative to the implementation of the scope and sequence outline include how to use a resource unit, an illustration of the use of a resource unit, suggested units by which a teacher might cover the material in the scope and sequence outline, and using current event material.

The illustrative resource units include three units for each of the grade levels of the junior high school. The material in these units may be used to cover parts of the content suggested in the scope and sequence outline. Resource units were developed for the following areas or topics:

For the seventh grade, Orientation, Growth of Democracy, and America's Outposts; for the eighth grade, Our Federal Constitution, Our State, and American Folklore; for the ninth grade, Our Schools, Our Community, and Choosing a Vocation. The outline used for developing these units included: (1) Title, (2) Introduction, (3) Anticipated Learning Outcomes, (4) Generalizations, (5) Activities for Introducing and Motivating the Unit, (6) Activities for Developing the Unit, (7) Activities for Culminating the Unit, (8) Suggested Methods for Evaluating the Unit, (9) Special Suggestions, and (10) Bibliography.

The suggestions for evaluating the overall General Education Program included tests of language art skills, work-study skills, social studies content, literature, attitudes, and critical thinking; opinion surveys of teachers, pupils, parents, employers, and others; follow-up studies of former students; experimental studies comparing the performance of pupils in General Education classes with the performance of pupils in separate English and social studies classes; and holding power studies.

The scope and sequence outline was developed as a cooperative project with the General Education teachers in the Springfield, Missouri junior high schools. Much of this cooperative work was carried out by a steering committee composed of a representative from each of the junior high schools. The writer directed this activity and was also a participant in it. The other materials were developed by the writer as individual activities.

The materials included in this study do not constitute a complete program. It will be necessary for additional resource units to be developed. The materials included in this study must be revised and kept up-to-date. The value of the materials in this study cannot be determined completely for several years.

Several recommendations were made relative to putting these materials to use in the Springfield, Missouri junior high schools. It was also suggested that additional resource units and other necessary materials should be developed by teachers in summer workshops and that these teachers be paid additional salary for this work. It was also recommended that the Springfield Public Schools secure such additional texts, audio-visual aids, and evaluation instruments as may be necessary to fully implement the materials included in this study.

552 pages. \$7.00. Mic 56-2155

**COMPARISONS OF TEST SCORES OF  
HIGH SCHOOL GRADUATES OF 1954 WHO GO  
TO COLLEGE WITH THOSE WHO DO NOT GO,  
AND A STUDY OF CERTAIN FACTORS  
ASSOCIATED WITH GOING TO COLLEGE**

(Publication No. 16,959)

Tom M. Jones, Ed.D.  
University of Arkansas, 1956

Major Professor: R. K. Bent

The purposes of the study were to compare test scores of Arkansas high school graduates who entered college with those who did not enter, to determine the reasons why some capable high school graduates did not go to college, and to study some of the factors affecting enrollment in college.

Included in the study were the Arkansas high school graduates who took the ACE Psychological Examination and the Cooperative English Test A: Mechanics of Expression under the state-wide testing program during the school year 1953-54.

Findings. The proportion of high school graduates who went to college the following semester ranged from 27.75 per cent for Negroes to 29.1 per cent for whites.

The high school graduates who enrolled in college were scholastically superior, with respect to test scores, to those who did not enroll. The difference was statistically significant at the .01 level for both ACE and English scores. There was considerable overlapping which showed that many of the nonenrollees were scholastically superior to a large number of enrollees.

The reasons given by 150 capable high school graduates for not going to college, in order of frequency, were lack of finances, preferred a noncollege school, marriage, military service, and preferred immediate employment.

The capable nonenrollees indicated that only 1.3 per cent of their fathers and 0.7 per cent of their mothers completed four or more years of college training, and 49.4 per cent of fathers and 35.2 per cent of mothers had no more than an eighth grade education.

Seventy-one per cent of the capable nonenrollees studied the college preparatory, or general, curriculum while in high school. Of the total, 38.7 per cent indicated that they planned to enroll in college at a later date, 48.7 per cent did not plan to go to college, and the remaining 12.6 per cent were undecided.

Most of the capable nonenrollees who became employed after graduation entered the clerical and sales occupations, and almost 40 per cent of them left the state soon after graduation.

The percentage of high school graduates who went to college was greater in communities with colleges than in communities without colleges. The difference between the percentages of those enrolled from college towns and non-college towns, in the case of the whites, was statistically significant at the .01 level, and, in the case of the Negroes, was significant at the .02 level.

More than one out of five of the high school graduates who entered college did so in out-of-state schools. The percentages were 22.4 per cent for whites and 18.0 per cent for Negroes.

Recommendations. On the basis of the findings of this study it is recommended that:

1. The state-wide testing program be continued and extended to include tests for freshmen and/or sophomores.
2. Secondary schools provide more adequate educational guidance so that capable students will become aware of the value of higher education.
3. Steps be taken on a state-wide basis for providing a system of scholarships for capable high school graduates who are financially unable to go to college.
4. Secondary schools locate students who plan to attend college and aid capable ones in securing financial assistance if needed.
5. Steps be taken to determine the need in Arkansas for semiprofessional technicians at a level requiring only one or two years of college training, and, if the need is great enough, establish community colleges for them.
6. All institutions of higher learning in Arkansas cooperate in establishing a research council to make a continuous study of the problems and needs of higher education

in the state with respect to articulation between secondary and higher education. 120 pages. \$1.50. Mic 56-2156

**AN EVALUATION OF A VOLUNTARY ACTIVITIES PROGRAM AS AN ENRICHMENT TO THE TEACHING OF GEOGRAPHY FOR PROSPECTIVE TEACHERS**

(Publication No. 16,722)

Alvin S. Keinard, Ed.D.  
The Pennsylvania State University, 1956

This study was an attempt to discover whether a voluntary, co-ordinated activities program in geography in the teachers college could improve the preparation for teaching the subject.

**The Problem:** The problem forming the basis of this study is threefold:

1. Will realistic experiences through voluntary student activities stimulate and increase interest in the study of geography?
2. Will participation in these activities and their co-ordination with the regular geography courses tend to increase learning of geography among prospective geography teachers?
3. Will co-ordination of the teachers college geography program with that of the public schools of its service area provide a greater incentive for study and increased learning for prospective geography teachers?

**Procedure:** A series of fifteen student activities was set up at the West Chester State Teachers College, for voluntary participation by the geography majors and minors. These projects were organized and developed by the Geography Professional Club of the College in co-operation with the faculty sponsors of the Club, and were co-ordinated with the regular geography courses. The following is a list of these activities:

1. Tutoring of freshman students.
2. Operating a college weather station.
3. Developing a geographic photography program.
4. Conducting geography field trips.
5. Collecting and classifying rocks and minerals.
6. Giving public school demonstrations on local geography.
7. Operating a motion picture program using geographical films.
8. Holding geography seminars.
9. Developing an urban mapping project.
10. Developing conservation of natural resources projects.
11. Constructing visual aids for use in geography teaching.
12. Corresponding with other geography clubs and organizations.
13. Publishing a newsletter.
14. Planning and holding professional geography meetings.
15. Developing a publicity program to promote interest in geography education.

A total of eighty-one students who were majoring or minoring in geography at the College became involved in the study. These students were given two diagnostic tests, one at the beginning and the other at the close of the full academic year involved in the geography activities program. A comparison of gains of participants and non-participants in the activities was then made.

**Analysis of the Findings:** The analyses and interpretations

were made with the use of statistical data, observations by the geography staff of the College, and evaluations by the participating college students and co-operating public school teachers.

**Conclusions and Recommendations:**

**Conclusions**

1. There was considerable evidence that the level of learning achieved by students participating in the geography activities was significantly higher than that of a comparative non-participating group. A comparison of mean gains of various groups showed that the students achieved values in proportion to their participation in the activities.

2. Considerable evidence of increased interest in the study of geography was manifested by the participating students.

3. A greater incentive and purposefulness in preparing to teach geography was observed among the activities groups, as compared to the non-activity groups.

**Recommendations**

1. Conduct a similar study of student activities, following groups of students throughout their four years in college.

2. Conduct a similar study of the effects on learning through the use of a co-ordinated activities program on both the elementary and the secondary school levels.

3. Conduct studies on the effect of activities on learning in other phases of geography, such as the historical and economic aspects of the subject.

4. Conduct studies in teachers colleges located in other geographical areas to determine whether success in learning geography through the use of activities is a general result, or one associated mainly with a particular set of circumstances.

**VITA**

Alvin S. Keinard was born in Pennsylvania in 1908. In 1933, he received the B.A. degree from Juniata College. He taught in the public schools; in the armed forces training program; as a graduate teaching assistant at the University of Wisconsin and at Clark University. In 1945 he received the M.A. degree at The Pennsylvania State College. He was head of the Geography Department of the State Teachers College, West Chester, Pennsylvania. The Doctor of Education degree was conferred upon him by The Pennsylvania State University in 1956.

243 pages. \$3.04. Mic 56-2157

**AN EVALUATION OF POST COLLEGIATE FOLLOW-UP PRACTICES IN THE IMPROVEMENT OF TEACHER EDUCATION**

(Publication No. 16,727)

John William Powers, Ed.D.  
The Pennsylvania State University, 1956

**Statement of the Problem**

It is the purpose of this study: (1) to determine the scope and limitations of collegiate follow-up practices throughout the United States, and (2) to evaluate a program of this nature as found at The Pennsylvania State University.

**Procedures**

To obtain the data on existing collegiate follow-up programs an Institutional Questionnaire was compiled for this study. This questionnaire was sent to 340 institutions. There were 202 replies. In addition, to aid the evaluation of The Pennsylvania State University Follow-up Program, two other questionnaires were prepared. The first, the Public School Administrator Questionnaire, was sent to 120 Pennsylvania public schoolmen. There were 100 respondents. The second questionnaire was sent to the beginning teachers. Of 100 questionnaires mailed to the new teachers there were 75 respondents.

**Findings on First Major Problem**

There were 107 institutions completely lacking in follow-up practices. Of the remaining 95 respondents only 20 had fully organized programs including regular visitation by college personnel. There were 34 programs categorized as semi-organized follow-up programs. These had annual success reports, but little or no visitation of the new teachers. Occasional visitation or reporting was listed by 41 colleges. These were classified as having incidental follow-up.

The major deterrents to the establishment of follow-up programs were in rank order of collegiate response:

1. Lack of financial support for such a program. 2. Lack of an adequate staff for such a program. 3. Geographical spread of teacher placement made it too difficult to conduct follow-up. 4. The value of follow-up did not warrant a shift of faculty to such an assignment. 5. Need for further evaluation of the present program practices to justify the expenditure of time, money, and personnel involved in such a procedure.

The best means of achieving the values of the follow-up program were:

1. Regular visitation and observation of the classroom work of the beginning teacher by the college personnel. 2. The use of individual standardized reports of visitation culminating in the summation report with recommendations for faculty action. 3. Supplementary to visitation, correspondence, college publications, supplying of curriculum material, and extension work will enrich the follow-up program.

**Conclusions**

1. There should be organized follow-up programs established in every teacher preparation institution of the United States. 2. Regular visitation by college faculty should be a feature of all follow-up programs. 3. Finances permitting, an independent coordinator should be entrusted with the administration of the follow-up program. 4. The public schools and the beginning teachers should be fully informed as to the objectives and services of the follow-up program. The spirit of partnership should be fostered. 5. Continuous self-evaluation of the follow-up program is necessary if improvement of the teacher preparation curriculum is desired. 6. The college visitor must be a person of high calibre both professionally and personally.

**Second Major Problem**

The evaluation of the follow-up program of The Pennsylvania State University.

**Findings on Second Major Problem**

The Pennsylvania State University was one of 21 re-

spondents of 202 institutions having a fully organized follow-up program. The university was one of 13 colleges that had a definite statement as to the program and objectives of follow-up. Only 19 institutions including The Pennsylvania State University had regular visitation with standardized reporting of the individual visitation. The university was one of 12 colleges that had final summation reports.

The outstanding features of The Pennsylvania State University Program of Follow-up were:

1. Regular visitation of the new teachers by the college faculty. 2. Of equal importance was the high calibre both professionally and personally of the college visitor. 3. Another important feature was the standardized reporting of individual teacher success culminating in the detailed analysis and evaluation of the summation reports. 4. The distribution of the summation reports to all members of the educational faculty made for a sharper awareness of beginning teacher problems, and resulted in corrective action to improve the undergraduate professional preparation.

**Conclusions** There should be:

1. Increased financing to enable visitation to reach every teacher graduate. 2. Establishment of an independent coordinator of the follow-up program responsible only to the head of the education department. 3. Increased participation in the follow-up program by the academic departments and the fields of special education. 4. A two-day conference for beginning teachers to be held on the campus sometime during the last of January.

**VITA**

John William Powers was born in Brooklyn, New York, on December 7, 1915. After graduation from the John Adams High School of Queens, New York, he attended Fordham University (B.S., 1937), and Teachers College, Columbia University, (M.A., 1938).

From 1939 to 1942 he was in the employment of the Sperry Gyroscope Company. Served with the United States Air Force (1942 - 1943).

Taught in the South Side High School of Rockville Centre, (1943 - 1945) and the Glen Cove High School (1945 - 1946).

In 1946 he was appointed an Instructor of History at St. Francis College of Loretto, Pennsylvania. In 1949 was made Assistant Professor of Education and 1955 Associate Professor. He graduated with a Doctor of Education Degree from The Pennsylvania State University, January 1956.

186 pages. \$2.45. Mic 56-2158

**IMPLICATIONS FOR CURRICULUM RESULTING  
FROM A STUDY OF DROP-OUTS AT  
MIDDLETOWN, NEW YORK**

(Publication No. 16,728)

John Andrew Rogers, Ed.D.  
The Pennsylvania State University, 1956

**Statement of the problem.** The purpose of this study was to ascertain facts concerning 513 early school leavers from the Middletown High School, Middletown, New York, June

1947 through June 1953, which might be useful in relation to improvement of the curriculum and the guidance program.

**Sub-problems.** To get facts needed concerning the drop-outs from the Middletown High School, answers to the following questions had to be secured:

1. At what months during the school year did the drop-outs occur?
2. At what age did early school leavers sever relations with the Middletown High School?
3. At what grade levels did early school leavers quit the Middletown High School?
4. What were the stated reasons given for leaving?
5. How may the validity of the stated reasons for leaving school be determined?
6. How may the real reasons be ascertained?
7. What effect did favorable summer employment have on school leaving?
8. How early in their school career did the drop-outs decide to leave school?
9. Could the early school leavers be identified in advance?
10. In which curriculum were most drop-outs enrolled, the "Regents Curriculum" or the "Local Curriculum?"
11. What were the facts relative to intelligence and achievement of the early school leavers?
12. To what degree had the drop-outs participated in extra-curricular activities?
13. What was the attendance record of the early school leavers?
14. What suggestions for parents and teachers would be forthcoming from a study of these drop-outs?

**Procedures.** Data for this study were secured from an examination of the record books of the school, from the cumulative guidance folders, and from the records of the exit interviews held with the drop-outs at the time of their leaving school. Additional facts were secured through personal interviews with seventy-six drop-outs subsequent to their leaving school and from questionnaires returned by forty-six others who had left the community after leaving high school. Through the use of the chi square test, it was ascertained that the interview sample was representative and adequate for the entire group of drop-outs, 1947 through 1953.

#### Conclusions.

1. More early school leavers quit during the summer months of July and August than at any other time.
2. The greatest number of drop-outs left at age sixteen.
3. Two-thirds of the early school leavers quit at the tenth and eleventh grade levels.
4. Eighty per cent of the early school leavers gave "to work" or "age sixteen" as reasons for leaving.
5. Interview and questionnaire reasons differed significantly from the reasons recorded in the permanent records at the time of quitting.
6. Favorable summer employment was not a significant factor in keeping the early school leaver from returning to high school in September.
7. More early school leavers tired of school while attending high school than when enrolled in grade school.
8. A great many more drop-outs were enrolled in the "Regents Curriculum" than were enrolled in the "Local Curriculum."
9. Intelligence test scores indicated that 96.4 per cent of the drop-outs had the native ability to do high school work.
10. The permanent records revealed that the majority of those leaving the high school had made subject marks in the 70's and 80's.
11. Many students of normal IQ and potential college ability leave the Middletown High School before graduation.
12. Many of the early school leavers said that nothing could have influenced them to stay to finish their education.

The study then proceeds with specific recommendations for the guidance and curriculum programs of the Middletown High School.

#### VITA

John Andrew Rogers was born in Auburn, New York, August 21, 1912.

After graduating from New Paltz State Normal School at New Paltz, New York in 1939, the degrees of Bachelor of Science in Education and Master of Science in Education were earned at The New York State College for Teachers at Albany, New York.

He is at present employed as a teacher and guidance counselor at the Middletown High School in Middletown, New York.

117 pages. \$1.46. Mic 56-2159

#### A STUDY OF SCHOLASTIC ACHIEVEMENT IN SECONDARY SCHOOL SCIENCE IN RELATION TO PUPILS' RELATIVE PREFERENCE FOR THIS SUBJECT

(Publication No. 16,525)

Warren Davis Shepler, Ed.D.  
University of Pittsburgh, 1956

This study is concerned with the association of accomplishment in natural science study of secondary school students with the relative degree of their preference for this subject. It set out to test two complementary hypotheses: (1) On the same levels of mental ability, student accomplishment in science study increases with increase in degree of subject preference. (2) On the same levels of subject preference student accomplishment in science increases with increase in degree of mental ability.<sup>1</sup>

The two independent variables which were examined statistically were measured by: (1) Terman-McNemar Test of Mental Ability and (2) Scholastic Preference Interview. The Preference Interview was a research instrument so designed that a respondent was required to make preferential choices of study behaviors of six scholastic areas, namely, science, language, mathematics, social studies, fine arts, and manipulative arts. Accomplishment was appraised by achievement scores on the science sub-test of the Harry-Durost Essential High School Content Battery.

The data used to test the two hypotheses were obtained from measures yielded by 827 twelfth-grade students. The scores in the three tests were transformed into standard scores with common mean and variance.

A statistical analysis of a population subsample of 250 cases which were normally distributed by mental ability but with chance variation in years of science study and relative preference for the subject yielded correlations of the following orders: (1) mental ability with accomplishment,  $r = .74$ ; (2) accomplishment with preference,  $r = .37$ ; (3) mental ability with preference,  $r = .16$ ; and (4) accomplishment with mental ability and preference,  $R = .81$ . An analysis of the expected accomplishment based on mental ability level with actual accomplishment of individual students yielded point-biserial correlations as follows: (1) accomplishment with mental ability,  $r = -.26$ ; (2) ac-

complishment with preference,  $r = .31$ ; and (3) accomplishment with mental ability and preference,  $R = .36$ . The relative contribution of the two independent variables in predicting accomplishment for the two analyses gave the following weights: (1) with heterogeneous mental ability levels: mental ability - 85% and science preference - 15%; (2) with homogeneous mental ability levels: mental ability - 42% and science preference - 58%.

The total experimental population ( $N = 827$ ) was stratified by stanine divisions of mental ability and relative subject preference. When these divisions were interlocked, a multiple classification analysis of variance of accomplishment was made. There were 28 cases in each cell, randomly chosen, except for the cell of lowest mental ability and highest preference for which the total population provided but this number of cases. In Table 1 the distribution of means is given.

TABLE 1. MEANS OF ACCOMPLISHMENT FOR LEVELS OF PREFERENCE FOR SCIENCE STUDY AND MENTAL ABILITY

Science Preference	Mental Ability			
	Low 23%	Middle 54%	Top 23%	Mean
High 23%	110.73	129.04	139.62	126.46
Middle 54%	108.08	118.10	133.00	119.76
Low 23%	106.50	116.88	128.15	117.18
Mean	108.44	121.37	133.59	

The values obtained when an F test of these nine means was made indicates that there is the highest probability that the mean of differences in accomplishment for the different levels of mental ability and of subject preference were not due to sampling error and are yielded by different populations.

The statistics derived from the population sample studied appear to justify the following inferences and conclusions.

- Both of the hypotheses stated above are supported in satisfactory degree.
- As a predictor of science accomplishment in groups with heterogeneous mental ability, level of mental ability is the best indicator of level of potential accomplishment.
- In groups homogeneous as to mental ability, level of preference for science study is the best predictor of an individual's potential accomplishment in science study for his level of mental ability.
- Preference for science study was found to be somewhat higher with higher levels of mental ability, and higher for boys than girls. Also there is close correspondence between number of years of science study and level of preference for this subject.

101 pages. \$1.26. Mic 56-2160

- Sones, W. W. D., *Agenda for General Study of the Influence of Students' Subject Preference on Their Scholastic Accomplishment*. Curriculum Laboratory Memorandum, University of Pittsburgh.

## A STUDY OF THE ORGANIZATION AND OBJECTIVES OF A SELECTED GROUP OF PENNSYLVANIA COLLEGES AND UNIVERSITIES

(Publication No. 16,729)

Robert Franklin Smith, Ed.D.  
The Pennsylvania State University, 1956

The study is limited to Pennsylvania institutions having an undergraduate, liberal arts program leading to the baccalaureate degree. The two areas studied in each of the selected schools were objectives and organizational plans. Each institution was contacted by mail or personal visit. From the 58 schools selected 33 were used in the final tabulation. The presidents of the colleges were first asked for the college catalogue, a list of objectives or purposes and a plan of the college organization. In cases of those not replying, organizational plans were drawn from the catalogue and other material, then submitted to these presidents for approval or correction. From these replies, and material obtained from the first contacts, five typical organizational charts were prepared. The principal difference in these charts concerned the relationship between the trustees and the college administration and varied from a simple unit type with a direct line of authority from the trustees to the various subdivisions to the more complex multiple type with the different major divisions of the organization being directly responsible to the trustees.

Analysis of the boards of trustees of the colleges showed the average size as 24 with a range from 4 to 46. Three colleges showed no trustees at all and 25% of the colleges showed no women among the members of the board.

Academically the deans have more preparation than do the presidents. All of the 58 deans have the master's degree at least as compared with 49 presidents. In earned doctor's degrees the deans have 38 as compared with 31 for the presidents. In honorary degrees the presidents outrank the deans with 39 as compared with 11 for the deans.

The second part of this study was concerned with the purposes of the colleges. A list of purposes numbering several hundred was compiled from the catalogues and other furnished material. These purposes were combined where common elements seemed to be present to the writer and a final master list of 48 was formulated, put into a check-list form, and submitted to the deans for indicating what purposes the deans thought were appropriate to their particular colleges. These returned check-lists were compared with purposes listed by the writer on the basis of information culled from the catalogues and other material available for that college. Considerable discrepancy was found between the number of purposes listed by the deans and those which the writer formulated from the catalogues. The t-ratio of 4.95 for the difference of the mean number checked by deans and writer was significant below the one percent level of confidence. Consequently, statements of purposes made by college catalogues may not accurately reflect the intentions which authorities of the college feel they are expressing.

To see more clearly the emphasized purposes, the entire list of purposes was grouped into concentrated areas by assigning the 48 purposes to the four major purposes of education as listed by the Educational Policies Commission; the six purposes or values listed by Spranger; and six purposes devised by the writer. When the three gen-

eral categories are reviewed there seems to be considerable agreement.

The conclusions drawn from this study are:

- (1) The organizational plans show a predominance of the unit type.
- (2) There is evidence to show a trend in direction of unit organization.
- (3) There is considerable difference between the stated purposes and the intended purposes of the schools in this study.
- (4) The schools in this study are primarily concerned with the development of the individual from a religious, moral, ethical, and scholastic point of view rather than political, civic and the economic.

#### VITA

Robert Franklin Smith was born in 1910 at Jersey Shore, Pennsylvania; received the Bachelor of Science degree from Lock Haven State Teachers College. He was granted a Master of Education from The Pennsylvania State University and a Doctor of Education from the same university.

He served in the U. S. Navy, has taught in Chapman Township, Jersey Shore High School and is now Head of the Department of Education at Lycoming College, Williamsport, Pennsylvania, where he has been associated since 1946. He is a member of Phi Delta Kappa.

115 pages. \$1.44. Mic 56-2161

#### AN EVALUATION OF THE BASIC COURSE OF THE MANAGEMENT DEVELOPMENT PROGRAM AT THAYER ACADEMY

(Publication No. 16,992)

Gordon Oliver Thayer, Ed.D.  
Boston University School of Education, 1956

**PURPOSE.** The purpose of the thesis is to determine changes in the understandings and need for training in human relations for first-line supervisors in industry as the result of instruction in the Basic Course of the Management Development Program. The program, in operation for five years, annually involves approximately 100 men and women and more than twenty-five companies. It is short-term training, consisting of twenty weeks of two-hour sessions each, or a total of forty hours.

**METHOD.** The research included experimental and control groups identified as trainees (32) and non-trainees (30) from eighteen companies. Three measurement periods were established as Pretraining, Posttraining I (at close of instruction) and Posttraining II (three months later). A questionnaire, test, rating scale and controlled interviews combined to obtain data for comparability of the study groups prior to instruction. Verbal devices involved in the measurement of changes as well as of comparability were the File-Remmers How Supervise? test (Forms A and B), an appraisal scale A Survey of Supervisory Needs in Human Relations Training, and structured interviews. Subjects, superiors and peers responded to the rating scale. Interview questions were confined to three concept areas: (a) Responsibility as a Supervisor, (b) Work Group Problem, and (c) Management Problem.

Statistical treatment warranted analyses of significant differences in terms of chi square and Fisher t computa-

tions for the questionnaire and test data. Rating scale data were examined for modal and item frequency differences. Interview response factors and frequencies therefore were examined for differences.

**FINDINGS AND INTERPRETATIONS.** **A. Pretraining Comparability.** Tests of significance computed for each of ten subtitle questionnaire data revealed no significant differences at the .01 level of confidence. How Supervise? test mean scores showed slight but non-significant (.01 level) non-trainee advantage. Modal differences and item frequencies for each degree of the rating scale indicated that the trainees needed more instruction in human relations. Interview response factors were comparable in variety and limited frequencies. However, there existed slight differences in the kinds of interpersonal factors. Exhaustive examination of Pretraining data revealed that the study groups could be considered comparable with the variances noted.

**B. Posttraining Changes.** At Posttraining I, test mean score gains appeared to favor non-trainees. Statistical analyses showed the gains to be non-significant. Modal differences and item frequencies for the compounded ratings indicated trainees needed less human relations training after instruction. It could not be assumed interview responses reflected instructional effects on understandings of human relations factors.

Posttraining II effects were apparently clearer but not substantially impressive. Residual trainee gains, although not statistically significant, were noted for the How Supervise? test mean scores. Appraisal data confirmed the decrease in training need for trainees reflected in Post-training I changes. The controlled interview responses were not appreciably altered at Posttraining II.

Although not altogether negative, effects of the Basic Course of the Management Development Program for first-level supervisors enrolled warranted two principal conclusions: (1) Instruction did little to reinforce or improve the trainees' understanding of human relations as an immediate effect but appeared to reflect a discernible residual effect; (2) After instruction, need for training in human relations, as appraised by subjects, superiors and peers, favored trainees, but the results were not particularly substantial as an immediate or even lasting effect. Two important implications inherent in the above conclusions are: (1) There should be sobering and possibly disquieting concern about materials, methods and even the length of training programs for first-line supervisors in industry; (2) Serious consideration should be given to evaluative devices other than conventional verbal techniques.

195 pages. \$2.55. Mic 56-2162

#### THE ADMINISTRATION OF PUPIL PERSONNEL SERVICES IN PENNSYLVANIA SCHOOL DISTRICTS OF THE SECOND CLASS

(Publication No. 16,736)

Clyde Herbert Wurster, Ed.D.  
The Pennsylvania State University, 1956

#### The Problem

The purpose of this study was to determine the desirability and feasibility of coordinating special services within

a single administrative unit of the organization structure of second class school districts in Pennsylvania. The special services included guidance, health, special education (including psychological service) and child accounting.

#### Procedures

The method was essentially a normative survey technique implemented by carefully structured interviews and supplemented by a search of annual and special reports of the participating school districts.

The following assumptions were tested:

1. Pupil personnel staff membership is sufficiently large to require management as a special administrative unit.
2. Characteristics of pupil personnel staff work loads present special administrative problems.
3. Sufficient interrelatedness and interdependence of function exists among the different services to warrant special provision for their coordination.
4. Under current practices in most districts, the administrative responsibility for the four areas of service is divided and dispersed to a degree which deprives the program of reasonable focus.
5. Functional pupil personnel service requires participation with related community agencies to a degree which warrants special administrative attention.

For purposes of processing data the 23 school districts involved in the study were divided into three groups according to pupil population. This system provided opportunity to study administrative characteristics peculiar to district size.

#### Results

Staff size. The average staff size was found to be 11 in the small districts, 18.5 in the middle sized districts and 34.8 in the large districts. Adequate membership was indicated to warrant special administrative provision for management and supervision.

Staff load showed wide variance among districts as well as among staff categories. Characteristics of pupil loads indicated that some districts were more interested in creating an impression of having the service than they were in standards of performance.

Staff participation showed significant interrelatedness and interdependence among the workers of each area of service. Child accounting staff depended on assistance from other areas for as much as 71 per cent of the total activity. Special education personnel were assisted with approximately 60 per cent of the activity required in this area. Health workers were relatively self-sufficient, requiring help with only 20 per cent of their activity. Guidance staff were assisted with as much as 40 per cent of the total activity in this area of service.

Administrative responsibility. Eighty per cent of the administrative responsibility for pupil personnel services was assumed by the superintendent of schools in the small districts. The delegation of responsibility to a variety of administrative personnel increased with the size of the district. Only four of the 23 districts showed effort to coordinate the services by a special administrator.

Agency contacts. The average number of regular contact situations with community agencies performing related

services ranged between 47 and 60 for each district. Pupil personnel administrators exerted significant influence on this phase of the program in the districts where they were employed.

#### Recommendations

1. Pupil personnel services in all second class school districts of Pennsylvania should function within a single administrative unit, under a specially trained administrator.
2. The procedure for effecting this administrative organization should be regarded as an evolutionary process.
3. Each district should examine its staff-pupil ratios in terms of the requirements for a reasonable standard of service.
4. Program emphasis should be reoriented to stress preventive procedures.
5. Pupil personnel services should be integrated within the organization structure of the Pennsylvania Department of Public Instruction.
6. Local districts should inventory existing provisions for the integration of these services as a first step toward administrative reorganization.

#### VITA

Clyde Herbert Wurster was born February 2, 1911 in Williamsport, Pennsylvania where he was graduated from the public high school in 1928.

He received his B.S. degree in Education in 1933, his M.Ed. in 1936 and the D.Ed. degree in 1956, all from The Pennsylvania State University.

He saw active duty in the U.S.N.R. from July 1944 to March 1946.

During 1934 and 1935 he served as Educational Advisor in the Civilian Conservation Corps. Since 1935 he has served the Williamsport School District as a junior high school teacher, school psychologist and presently as Director of Pupil Personnel Services.

He is professionally affiliated with the American Psychological Association, the American Association on Mental Deficiency, the National Education Association and Phi Delta Kappa.

169 pages. \$2.11. Mic 56-2163

#### TEACHER REACTION TO THE FEATURES AFFECTING INSTRUCTION IN NEW ELEMENTARY CLASSROOMS

(Publication No. 16,993)

Raymond Wyman, Ed.D.  
Boston University School of Education, 1956

Most producers conduct regular research to determine how consumers react to their product. This is a period in which many architects and building committees are producing new elementary classrooms to be used by teachers. This study is concerned with the characteristics of some of the classrooms produced and the teachers' reaction to them.

It is important to find teachers' reaction to the features affecting instruction in classrooms because they are in the best position to evaluate them. In too many cases the classroom teachers have been practically ignored until the building was ready for occupancy. It should be possible to provide some help for future building committees from reactions to the work of past building committees.

The instrument for determining what facilities teachers have and prefer was a five page checklist mailed to 2500 elementary teachers of Massachusetts and Connecticut in new school classrooms constructed between 1945 and 1954. Conclusions are based on 981 replies. The checklist inquired about spaces, visual considerations, heating and ventilation, plumbing, furniture, acoustics, storage, electrical considerations, communications, chalkboard, tack-board, audio-visual equipment and miscellaneous characteristics.

The study was designed to determine what classroom characteristics are most common and what are most wanted, and if there is an important relationship between preference for certain classroom facilities and grade, experience, room exposure or type of teacher. Three types of teacher, upper, middle, and lower were provided by a part of the checklist which was designed to discover how well they were following certain practices characteristic of desirable modern elementary education.

A study of the literature concerning teacher planning of educational facilities indicated that most authorities feel that teachers should be involved in the educational planning of the spaces that they will use, but that they have done very little of it. This study indicates that although most teachers' part in designing the building was insignificant, a large majority of them are willing to contribute time and effort toward classroom design.

Despite the fact that teachers have had very little part in planning the facilities that they use, they are, on the whole, very well satisfied with what has been provided for them. In only a few instances did the teachers generally disapprove of what has generally been provided.

Very few large differences in classroom preference can be traced to grade, experience, room exposure or type of teacher.

The kindergarten is usually different from the other grade rooms, and the other grade rooms are more alike than different.

There are few differences in preference related to teaching experience, except that more experienced teachers marked "no preference" considerably more than the others.

There seem to be slight differences between visual considerations in north exposure rooms and the others.

There are few differences in preference related to the type of teacher as defined in this study. Either the modern and traditional teachers prefer about the same facilities, or the checklist failed to produce true groups.

No standard classroom stems from this study. There are few facilities that are wanted by a large majority of the teachers, and almost any item mentioned is wanted by a substantial minority of them. Variety rather than standardization seems to be indicated.

In future classrooms, attention should seemingly be given to the provision of a variety of movable facilities in quantities less than the total number of classrooms to provide for individual preferences.

Any conclusions arrived at from this study of class-

room environment are only tentative. The techniques of building and the techniques of teaching are constantly changing, and improved ways of determining one to accommodate the other must always be sought.

322 pages. \$4.15. Mic 56-2164

#### SYNTHETIC AND ANALYTIC TENDENCIES IN THE ART EXPRESSIONS OF THIRD GRADERS

(Publication No. 16,737)

Alexander Joseph Zawacki, Ph.D.  
The Pennsylvania State University, 1956

Two modes of concept formation are apparent in the art expression of children. These are the synthetic and the analytic approaches. It was the purpose of this study to observe and report on an experiment involving the synthetic and analytic approach of third graders to claywork and crayon drawing.

Synthesis was defined as a tendency to focus on detail, to combine or construct various large elements, fragments, details, or experiences into a higher total concept.

Analysis was defined as the capacity to apprehend a total form or concept, and to be able to analyze the whole form or concept in terms of its essential and significant parts; and the ability to reconstruct this total concept.

The problem then was to determine whether it was possible at this age level, to isolate the synthetic and analytic tendencies in claywork and crayon drawing.

The subproblems were: (1) could the methods of approach be identified and measured with accuracy, (2) was there a consistency of approach to the other media?

Three randomly spaced samples of claywork, three crayon drawings, notes from direct observations, and an intelligence test were secured from each of the third graders participating in the study.

The claywork was judged as synthetic or analytic on a five point scale ranging from extremes of analytic to synthetic. Six criteria for the claywork were selected.

1. Object made from one piece or many pieces.
2. Number of features made by adhering or by indentations.
3. Form and proportion as a related whole or as value relationships.
4. Surface as a fused whole or as differentiated areas.
5. Extremities pulled out of the mass or adhered.
6. Extremities bent at the joints or interrupted at the joints.

The crayon drawing was evaluated on the basis of nine criteria which were:

- |              |                    |                |
|--------------|--------------------|----------------|
| 1. Awareness | 2. Organization    | 3. Baseline    |
| 4. Verticals | 5. Differentiation | 6. Color       |
| 7. Outline   | 8. Overlapping     | 9. Proportions |

Intercorrelations were computed to determine the reliability of the criteria for claywork and crayon drawing, and for the reliability of the judging of the art work.

The correlation between the groups of judges was .84.

A correlation coefficient of .267 was sufficient to reach the 1% level of confidence, since the number of subjects in the study was 97.

Three multiple correlations were computed between the various measures used in the experiment.

The first multiple correlation of clay product, the criterion, and crayon drawing and mental age was .499.

The second multiple correlation of clay product, the criterion, and clay process and crayon drawing was .592.

The third multiple correlation using the Wherry - Doolittle Test Selection Method with clay product and process combined as the criterion, with crayon drawing and mental age was .523. In the test selection method, mental age added nothing to the relationship and in fact introduced error.

Thus it can be concluded, on the basis of the criteria, and the high agreement of the judges, that it is possible to isolate the synthetic and analytic tendencies of third graders. It may also be concluded that there is a consistency of approach to other media, since the results of the test selection multiple correlation,  $R = .523$ , showed here that the child who draws synthetically tends to do claywork synthetically, and the child who draws analytically tends to do claywork analytically.

A compilation of the scoring indicated that the third grader is skewed toward the synthetic end of the scale. Therefore he is predominantly synthetic in concept formation. A subfinding of importance was that intelligence appeared to be unrelated to type.

#### VITA

Alexander Joseph Zawacki was born in Detroit, Michigan, June 15, 1918. He was graduated from Saint Anthony High School, and attended Wayne University in Detroit, Michigan, receiving the Bachelor of Science degree in 1948, and the Master of Arts in 1949.

He has taught at Drake University in Des Moines, Iowa, and at Western Washington College of Education, Bellingham, Washington.

He received the Doctor of Philosophy degree from The Pennsylvania State University, in January, 1956.

139 pages. \$1.74. Mic 56-2165

#### EDUCATION, ADMINISTRATION

##### CRITICAL AREAS IN THE ADMINISTRATIVE BEHAVIOR OF HIGH SCHOOL PRINCIPALS

(Publication No. 17,383)

Dean Oscar Clark, Ph.D.  
The Ohio State University, 1956

The study of high school principals summarized here parallels three similar concurrent studies of elementary school principals, executive heads, and superintendents. Out of the Kellogg Foundation—sponsored School-Community Development Study at Ohio State University emerged this list of nine categories of behavior which were tested for their inclusiveness in describing all administrative behavior and for their adequacy in discriminating between ef-

fective and ineffective administrators: appraising effectiveness, communicating, coöordinating administrative functions, determining roles, involving people, making policy, setting goals, using educational resources of the community, and working with community leadership. Independently observed and recorded behavior of high school principals was categorized, the categories were verified by co-workers, and these data were compared with independent jury ratings of the principal's over-all effectiveness.

The original nine categories were found to be inadequate to describe all administrative behavior of high school principals, but this list was reasonably adequate when a new category called "showing consideration" was added. Chi square tests of significant differences were applied to the frequencies of behaviors for the two groups of administrators. Effective high school principals had a significantly higher frequency of behaviors categorized as communicating and showing consideration than did the ineffective administrators.

Thirteen other categories of behavior emerged and were tested. Some of these new categories, such as initiating communication and delegating functions, were revisions of the original nine a priori categories, and some were new concepts, such as planning (or anticipating) and making face-to-face contacts. All four examples of the new categories just mentioned were significant in discriminating between effective and ineffective administrators. The four new ones and the two mentioned earlier were all highly correlated.

Categories of behavior not discriminant were: appraising effectiveness, clarifying problems, coöordinating functions, determining roles, involving people, making policy, setting goals, using educational resources, working with community leadership, speaking disparagingly, engaging in communication initiated by others, talking, telephoning, writing, disseminating information, reading, and seeking or studying recorded data.

Analyses were made of the classes of persons to whom the behaviors were related: pupils, student office aids, teachers, assistant principals, superintendent's staff, other educators, non-certified personnel, parents, and community members who were not parents. In this analysis, talking, which was not discriminant generally, was discriminant only when considered in relation to teachers. Generally, effective administrators had more contacts with teachers than with pupils. Ineffective principals had more contacts with pupils than with teachers. This finding was interpreted to mean that effective principals worked through the teachers and maintained a communication or organizational structure.

Effective administrators seemed to exemplify practically every behavior hypothesized suggesting the presence of an energy output factor. This finding was listed as one of the criteria for the selection of candidates for administrative positions. High school principals differed greatly in respect to office procedures. The effective ones used very systematic procedures which solved problems satisfactorily and relieved them of time-consuming repetitive functions.

It was concluded that the focus on the behavior or activity pattern of administrators was a very fruitful approach for educational administrative practice, training, and research. However, since this behavior can be described in many ways, certain precautions must be taken in defining categories and units of behavior.

225 pages. \$2.95. Mic 56-2166

**A STUDY OF THE EXPRESSED ATTITUDES OF ELEMENTARY SCHOOL EDUCATORS, ELEMENTARY SCHOOL CHILDREN, AND PARENTS OF ELEMENTARY SCHOOL CHILDREN CONCERNING THE CURRICULUM, TEACHING METHODS, SCHOOL PLANT, AND SCHOOL PERSONNEL**

(Publication No. 16,987)

Philip Oldham Coakley, Ed.D.  
Boston University School of Education, 1956

**Purpose of the Study.** — This study was suggested by an apparent lack of understanding among parents, children, and those who run the schools, and the need for better public relations between the school and the community. This study intended:

1. To survey the expressed attitudes of elementary school children, their parents, and elementary school educators with regard to the curriculum, teaching methods, school plant and school personnel.
2. To investigate the influence of socio-economic classification on these expressed attitudes.
3. To investigate the influence of grouping on these expressed attitudes.
4. To develop an instrument and a technique that will aid educators to systematically survey the attitudes held by children, parents, and educators toward the elementary school program.

**Plan of the Study.** — The setting for this study was a city of 105,195 people in Southeastern Massachusetts. The initial procedures included a partial sampling from three schools of different socio-economic structure. From a free-writing response technique administered to the children, and from personal interview of parents and educators, the instrument, a 96 item inquiry form, was evolved. The final survey, city-wide, was set up on a strict sampling basis of ten per cent of the total population of children of the fourth, fifth, and sixth grades from 29 schools. Three hundred and sixty-five children, 365 parents, and 262 educators participated in the final survey.

**Statistical Design.** — Responses to items were tested for significant differences among classifications and within groups by chi square methods. Results showed that responses to 95.49 per cent of all statements were made independent of classification. Comparison and analysis of responses were made within and among groups and categories. Also, to provide a satisfactory test of the null hypothesis, double classification analysis of variance with means adjusted for disproportionality among the subclasses was employed. Statistical computations gave no evidence for rejection of the hypothesis.

Twenty reliability estimates were computed by the Hoyt method for all groups and categories. Overall reliability estimate was 0.952. Measures of dispersion were computed and fiducial limits estimated.

**Findings and Conclusions.** —

1. An instrument and a technique have been developed that will aid educators to survey the attitudes held by children, parents, and educators toward an elementary school program.
2. Pupils and parents as groups were in agreement in their thinking on 93.75 per cent of the items, which might substantiate the idea of pupils acquiring and maintaining

parent-made attitudes.

3. Pupils and educators as groups were in agreement in their thinking on 77.08 per cent of the items in the inquiry. Although there is general agreement, the maturity factor of the respondents must be considered.

4. Parents and educators as groups were in agreement in their thinking on 79.16 per cent of the items. However, educator disagreement with regard to all groups assumed a percentage of 18.7 whereas parent disagreement between or among groups assumed a percentage of 0.02. Parents assumed a higher percentage of 'no opinion' responses than other groups.

**Implications.** —

1. Although there was general agreement, the disagreement on some statements and the presence of minority disagreement on others points out the need for action on the part of educators with regard to the curriculum, teaching methods, school plant, and school personnel.

2. Educators appear reluctant to accept change.

3. Parents and children appear to be more forward looking than educators on many items surveyed.

4. Parents have the responsibility of visiting the schools since satisfaction or dissatisfaction may hinge upon factual condition or misunderstanding.

5. There should be closer cooperation among school administrators, teachers, and parents.

6. A continuous evaluation, plus an informative public relations program, is essential for a good educational program.

279 pages. \$3.60. Mic 56-2167

**A JOB ANALYSIS TECHNIQUE APPLIED TO SELECTED ELEMENTARY PUBLIC SCHOOL ADMINISTRATORS IN EASTERN MASSACHUSETTS**

(Publication No. 16,988)

Ado Commito, Ed.D.  
Boston University School of Education, 1956

**Purpose of the Study:**

The primary purpose of this job analysis was to secure sufficient information of the job of the elementary school principal from a representative segment of the population in eastern Massachusetts.

**Procedure:**

The following procedure was utilized to accomplish this purpose:

1. Literature was reviewed to locate and collect the content of the inquiry form.
2. The use of a principal's advisory committee, a validity technique, in the development of the inquiry form was made in order to identify and describe the job of the elementary principal.
3. The tentative investigating instrument was submitted to the test of a preliminary try-out.
4. The final inquiry form requested the principals to rate the Importance, the Frequency of Performance, and the Difficulty of Performance of 115 duties and responsibilities. Certain other pertinent identification data was also requested. The superintendents and teachers were to respond on the scale by rating each item for Importance only.

5. Thirty school systems located within a 25 mile radius of Boston were selected by random sampling to provide the participants.

6. The research instrument was mailed to 120 principals selected by sampling the population in order to collect data about the job. Another form of the instrument was mailed to 28 superintendents and 65 teachers.

7. The reliability coefficients were computed according to Hoyt's estimates of reliability, Hoyt's version of the Kuder-Richardson formula (20). A reliability estimate was computed for each section of the instruments for the three different groups of participants. The over-all estimates of reliability were: Principals; Frequency of Performance, .977; Difficulty of Performance, .979; Importance, .987; Superintendents, Importance, .982; Teachers, Importance, .977.

8. The chi-square technique was the statistical method used in this investigation for the testing of hypotheses concerning the distribution of frequencies. The replies to each of the 115 statements by principals, superintendents, and teachers for the criterion of Importance were tested for significance by this statistical method with the ratings in dichotomy.

9. The ratings of principals to the Frequency of Performance were dichotomized and Difficulty of Performance were trichotomized in the item analysis, with the two and three classes of the variables available in percentages.

10. A summary of the personal and professional status of both supervising and teaching principals who participated in the study was included in this investigation.

#### Findings:

Within certain limitations the following conclusions were drawn:

1. There was no difference statistically between the ratings for Importance made by principals, superintendents, and teachers in 90 of the 115 items in the investigating instrument. Considered most important by the three classes were: (a) maintaining order and discipline in the school, (b) offering constructive help to teachers who recognize the need, (c) observing the practice of safe and healthful behavior by all pupils in lunchroom, toilets, playground and gymnasium, and (d) evaluating the physical and instructional efficiency of the plant permitting an environment which is sanitary and safe. Rated least important were: (a) planning social activities and entertainment of the staff, and (b) operating audio-visual equipment.

2. On eleven duties and responsibilities there was found to be a real difference in the ratings for Importance by the three groups of educators.

3. Duties and responsibilities performed most frequently by principals are those dealing with people rather than clerical details. Many activities in supervision are performed frequently according to the principals and most of these were rated important. The principal's activities pertaining to the plant is most extensive in supervising for safety and maintenance. Considered most difficult to perform are those having to do with problems of individual teachers in personnel leadership.

4. On the basis of the data presented the probabilities were that the characteristics obtained of principals were "typical" of the group in eastern Massachusetts.

5. This study suggests that there are areas in the work of the elementary principal which should be re-evaluated by the principal, superintendent, and teachers in order that the principal may spend his time most effectively in the leadership of the school.

272 pages. \$3.50. Mic 56-2168

The items following each abstract are: the number of manuscript pages in the dissertation, its cost on microfilm, and the Library of Congress card number.  
Enlargements 5-1/2 x 8-1/2 inches, 10 cents per page. No postage is charged if check or money order accompanies order.

#### AN ANALYSIS OF THE FIELD SERVICE PROGRAM OF KANSAS STATE TEACHERS COLLEGE, EMPORIA, IN RELATION TO THE EXPRESSED NEEDS OF THE USERS

(Publication No. 15,322)

Herbert A. Derfelt, Ed.D.  
University of Arkansas, 1956

Major Professor: R. M. Roelfs

The problem in this study was to analyze the field service program of Kansas State Teachers College, Emporia, to determine the extent to which it is in agreement with (1) accepted principles, criteria, and recommended practices; and (2) the recognized needs of school personnel in its service area, in view of the available financial and human resources.

The data, presented in tabular form, were collected primarily from (1) a study, sponsored by the American Association of Colleges for Teacher Education, of in-service education and field service programs; (2) a study by the National Extension Association; (3) questionnaires sent to all county superintendents, a representative sample of school administrators, and a random sample of teachers of the public schools of Kansas; (4) interviews with the Field Service Committee and other key personnel of Kansas State Teachers College, Emporia.

The findings of this study show that the current field service program at Kansas State Teachers College, Emporia, compares favorably with field service programs of similar institutions. These comparisons and the opinions of Kansas school personnel who responded to this study have led to conclusions, among which are the following:

1. KSTC, Emporia, is in need of a definite statement of specific objectives.
2. The present arrangement whereby the field service council is an advisory body to the field service director is basically sound.
3. A lack of systematic coordinate studies and surveys to reach Kansas school personnel is noticeable.
4. In the undergraduate program, present restrictions would not be necessary if the instructional circumstances approximated those on the campus.
5. Distance is a factor in participation in extension activities by school personnel.
6. Kansas school personnel consider credit services most needed to improve the educational program of the state.
7. County superintendents are contacted less than other school personnel to discover extension and field service needs.
8. Field service needs of professional educators are not being adequately met in non-credit services.
9. Cooperative over-all planning of field service needs and opportunities among state institutions is needed.

The following recommendations were made:

1. That the Field Service Council be continued with modification as to representation, selection, and term of office.
2. That the present administrative unit be continued with the addition of an assistant director in charge of non-credit activities and changes in regard to duties and responsibilities of administrative staff.
3. That specific qualifications be established for Direc-

tor of Field Services and assistants so that the service may function as an integral part of the institution.

4. That a statement of specific objectives be formulated for the field service program at KSTC, Emporia, based upon accepted criteria presented in this study.

5. That field service activities be of the same standards as on-campus activities and that the work done be counted the same as residence credit except in graduate school.

6. That systematic uses of definitive methods and techniques be made to discover the extension and field service needs of schools and school personnel.

7. That cooperative planning among institutions in Kansas be established to assure better coverage and less duplication through collegiate field services.

8. That in certain areas of Kansas the number of extension activities for credit be increased.

9. That KSTC, Emporia, assume the necessary financial burden to carry out a functional field service program.

10. That specific areas of non-credit activities be expanded to meet the needs of school personnel.

11. That a systematic and coordinated follow-up service for teacher-education graduates be established.

289 pages. \$3.75. Mic 56-2169

#### AN EXPERIMENT WITH MODERATELY GIFTED CHILDREN IN THE PUBLIC HIGH SCHOOLS OF CEDAR RAPIDS, IOWA

(Publication No. 16,780)

Ruie Byron Doolin, Ed.D.  
University of Missouri, 1956

Supervisor: John Rufi

#### PURPOSE: To test the two null-hypotheses:

A special program for moderately gifted children homogeneously grouped will not cause positive educational change that is significantly above the growth of a similarly advanced group in a regular class without any special program.

A special program for moderately gifted children homogeneously grouped will not cause gains in terms of personality and pupil adjustment, that are significantly above those of a similarly superior group in a regular class without any special program.

A concomitant objective of the study was to ascertain from the parents of the experimental group evidence of any changes in their attitude regarding the school.

**METHOD OF RESEARCH:** The experimental method was utilized in this study. There were two sections each of the experimental and control groups. Each section, though not perfectly matched, was comparable to any other section. A parental attitude questionnaire was utilized to collect information from the parents of all pupils included in the study.

#### SUMMARY:

(1) How to educate youth of high intelligence is an old problem.

(2) The idea that public schools are obligated and committed to "turn them out all alike" has been a deterrent to educational programs for the bright pupil.

(3) In America there persists a tendency to idealize the average man and to belittle the exceptional man. Enthronement of the average and an idea that it does not pay to be too different are popular notions in our present culture.

(4) It was found that "more" and "better" best characterize the bright pupil.

(5) The pupil endowed with high intelligence and special gifts is a priceless natural resource.

(6) Evidence is convincing that public schools are neglecting the education of the gifted.

(7) Three accepted methods of providing educational programs for bright students are acceleration, enrichment, and segregation of classes.

(8) The data from the questionnaire reveal that parents of the pupils of both schools highly endorse the educational program of the school. There was little change in attitudes among parents of the pupils of both groups.

#### CONCLUSIONS:

(1) The homogeneously grouped pupils excelled, to a significant degree, the pupils in the regular classroom in achievement in areas closely related to the subject matter material as measured by standardized tests.

(2) Among moderately gifted pupils studied, the lower achievers performed in a pattern similar to the higher achievers of the group. Both experimental sections out performed both control sections.

(3) In the area of pupil adjustment the experimental group was not favored over the controls.

(4) The educational program did not cause a better attitude to obtain among the parents of the children with the experimentals.

#### RECOMMENDATIONS:

(1) A continuous program of research to evaluate the results of the educational program of the high schools is indicated.

(2) Grouping pupils in homogeneous classes on the basis of ability to perform, is recommended. Sections should be flexible.

(3) Improved educational techniques can be maximally effective only when there is an efficient staff to implement them. Therefore, it is recommended that a teacher training program be set up to re-train the present staff, where needed, in appreciation of and in working out the new methodology of special class teaching. Teacher training to meet this problem could be accomplished through teacher training institutions, and through on-the-job training. In any event, it is essential that the point of view of classroom teachers be solicited at all times, and that their techniques be constantly developed and improved throughout their career.

254 pages. \$3.18. Mic 56-2170

**THE PROJECTION OF SCHOOL QUALITY  
FROM EXPENDITURE LEVEL**

(Publication No. 17,054)

Orlando Frederick Forno, Ph.D.  
Columbia University, 1956

**INTRODUCTION**

The support of public school education by compulsory local taxation has been in effect less than a century. The present study covers more than one third of its duration. The modern concept of state aid distribution, pointed towards achieving equalization of educational opportunity, has been in operation less than a third of a century. The present study covers its entire span.

**PURPOSE OF THE STUDY**

The present study deals with the relationship between expenditure level and school quality. Its purpose is to determine the nature and character of the influence of expenditure level on school quality over a twenty-five year period. Subsidiary purposes are two-fold: 1) to establish the relative reliability of the expenditure level measure, and 2) to determine the best possible measure of expenditure level for the prediction of school quality.

**PROCEDURE OF THE STUDY**

To get at the nature and character of the influence of expenditure level upon school quality, each year's current expenditure over a twenty-five year span was correlated with school quality as measured at the end of the time span. This procedure was carried out for two sets of independent data over two overlapping twenty-five periods. Correlations between expenditure level for each year from 1921 to 1945 and adaptability as measured in 1945 were calculated. Similarly, correlations between expenditure level for each year from 1931 to 1955 and adaptability as measured in 1955 were computed.

The same procedure was carried out using three year expenditure levels instead of single year expenditure levels.

To obtain a better insight into the nature of the influence of expenditure level upon school quality, the average expenditure of the two clusters of Council schools were compared to certain national economic indicators both in terms of actual and constant dollars.

The attempt to stabilize the predictive power of expenditure level made use of multiple correlation.

**SOURCES OF DATA**

Expenditure data have been gathered on two clusters of Metropolitan School Study Council communities. The first cluster consists of forty-eight school systems. The quality of the educational program was measured by the Mort-Vincent Newell Growing Edge, an instrument designed to measure the adaptability of a school system. The evaluating was done in 1945. The second cluster consists of sixty-three communities. They were evaluated with the same measuring instrument--The Growing Edge--in 1955.

**FINDINGS OF THE STUDY**

1) Expenditure level and adaptability were highly re-

lated for each and every year for the twenty-five years previous to the 1945 and 1955 base quality measurement years.

2) Expenditure level and adaptability were markedly related for each and every year for eleven years previous to the 1945 and 1955 base quality measurement years.

3) Individual communities tended to be either high, average, or low expenditure communities for several decades.

4) When schools were evaluated after a relatively stable era, previous expenditure levels made greater contributions to the prediction of the base quality measurement year scores than the current expenditure level.

5) When schools were evaluated during an inflationary era, current expenditure made a greater contribution to the prediction of the base quality measurement year scores than did previous expenditure levels.

6) The 'expenditure level-quality' relationship was shown to be around .60. If the quality measurement period occurred during an inflationary era, the relationship tended to be depressed. However, when secular effects were taken into consideration and accounted for, the relationship was increased to its proper value, which appears to be around .60.

7) War and depression adversely affected expenditure level. The decrease in expenditure level (in terms of purchasing power) of schools during the depression and World War II helped to explain the decrease in the percentage of good educational practices normally expected to be introduced.

8) The expenditure level pattern of fiscally favored communities paralleled the economic indicators of the nation in terms of actual dollars.

80 pages. \$1.50. Mic 56-2171

**AN ANALYSIS OF CERTAIN FACTORS  
ASSOCIATED WITH FINANCING CAPITAL  
OUTLAY FOR TEXAS PUBLIC SCHOOLS**

(Publication No. 17,169)

Allen James Herndon, Ed.D.  
North Texas State College, 1956

The problem of this study is to determine the desirable characteristics of a sound program for financing Texas Public School Buildings--commensurate with need and with an equitable relation between state and local effort.

Sources of data include books on public school finance, periodicals treating of school finance problems, and surveys of state programs of school finance. The Texas Education Agency provided enrollment data, capital outlay surveys, and other information pertinent to the study. State education officials of other states provided publications on their respective programs with comments as requested for evaluation purposes.

Criteria are developed and used to evaluate finance programs in operation and proposals made in the study.

The twenty-three state programs providing assistance for financing capital outlay are analyzed. From the analysis certain features are drawn and evaluated for inclusion in the proposals.

A measure of need for Texas schools is presented. The ability to finance these needs under present provisions is discussed.

The study proposes that capital outlay needs in Texas be financed through a comprehensive foundation equalizing program. An equalization technique is developed by the use of the small fund plan for equalization. The equalization technique is illustrated by application to fifty selected school districts in Texas. Administrative features of the proposed plan are discussed and evaluated.

Conclusions of the study are as follows:

1. A public school finance program for capital outlay which adheres to the principles of equalization, democracy, adaptation, variability, stability, and prudence could be adjudged a sound one.
2. Of the twenty-three state programs for assistance in financing capital outlay, the equalizing foundation type is definitely the most desirable.
3. It does not seem advisable to attempt to establish a specific figure for Texas school building need without a state-wide survey.
4. There seems to be no doubt that present provisions for financing capital outlay in Texas have fallen short of meeting needs. Indications are that many school districts will encounter serious difficulties in providing needed building facilities.
5. Evidence indicates that a combination of state and local effort is needed to finance building programs and may be effected equitably through a comprehensive foundation program.
6. The small fund plan of equalization can be used to fix local and state effort equitably.
7. Federal funds which might be made available can be handled under existing laws.

The study makes the following recommendations:

1. Immediate attention should be given by the state to the problems of the local districts in providing buildings and provisions made for substantial financial aid. It is believed this should be accomplished by a comprehensive minimum foundation program. No allocation of capital outlay assistance should be made which does not take into account ability and effort.
2. Before any program is developed in detail a state-wide survey should be made to fix local needs and appraise accurately the ability to finance needs locally.
3. The question of permanent school centers should be included in the development of a state program for capital outlay.
4. The problem of assessment ratios needs a more direct solution than is presently provided.
5. It is further recommended that any federal funds for general use be accepted under terms of existing laws regarding their control. 197 pages. \$2.60. Mic 56-2172

#### A STATISTICAL DESCRIPTION OF FACTORS RELATED TO DROP-OUTS AND NON-DROP-OUTS AT NORTHWESTERN STATE COLLEGE

(Publication No. 16,978)

Milton W. Lehr, Ed.D.  
The University of Oklahoma, 1956

Supervisor: Dr. Gail Shannon

The factors related to the holding power of an institu-

tion vary widely from college to college. Socio-economic conditions, the geographical location of a college, the location of other colleges, and many other factors combine to make it necessary that each school study its own students if usable information is to be secured.

In an effort to identify a number of these factors at Northwestern State College, Alva, Oklahoma, a statistical comparison was made of 343 non-drop-out and 174 drop-out students. Only those students who enrolled in the college as freshmen for the first time in September of the years 1950 through 1954 were included. Twelve factor areas were selected for consideration. The data relating to these factor areas were secured from the official records of the College.

The following constitute a summary of the salient findings:

1. The grade-point average of the non-drop-out group was significantly higher at the .01 level of confidence than that of the drop-out group.
2. No evidence was found that any relation exists between drop-outs and their age at the time they first enter into this College.
3. A significant difference favoring the non-drop-out group was found at the .01 level of confidence for the factor of "course load."
4. The distance a student lives from this College is not a factor in determining whether he will remain in or drop from the school.
5. The English and reading ability of the students included in the study apparently has no appreciable connection with their remaining in or withdrawing from the College.
6. There is no evidence that any relationship exists between drop-outs and their place of housing while in attendance in this College.
7. Whether students were married or single at the time of their entrance into college had little bearing on the facts relating to their leaving the College.
8. There is no evidence that any relationship exists between the parents' occupation and their offspring leaving college prematurely.
9. Although not significant in a statistical sense, there is a strong tendency for a greater proportion of the female students to drop from school than is true of the male students.
10. The military service status of a student was found not to be a contributing factor in determining whether a student became a drop-out.
11. The level of intellectual ability of the students had no appreciable connection in determining whether the students remained in or left this College.
12. Most of the drop-out group were of sufficiently high intelligence to do normal course work at this College.

87 pages. \$1.50. Mic 56-2173

**COST TO PUPILS WHO ATTENDED  
SELECTED PUBLIC WHITE SENIOR  
HIGH SCHOOLS IN ALABAMA**

(Publication No. 17,015)

Eldridge Esau Nelson, Ed.D.  
Alabama Polytechnic Institute, 1956

Chairman: Raymond White

In effect, the cost to pupils for participation in any part of the school-sponsored program should be such that it is not a factor in determining whether or not a pupil participates. The entire offering of the public high school should be available to all pupils eligible to attend who would profit by participation in these programs.

The purpose of this study was to determine the extent and amount of pupil participation costs in white public senior high schools of Alabama for the school year 1954-1955. Senior high school was defined as grades ten through twelve.

Cost to pupils was determined by considering the following questions:

1. What pupil costs are involved in pursuing academic subjects?
2. What pupil costs are involved in engaging in extracurricular activities?
3. What pupil costs are involved in general school participation?

**METHOD OF PROCEDURE EMPLOYED**

A questionnaire was designed to determine pupil participation costs in the three areas listed above. Data on the questionnaire and supplementary information were secured through a personal survey by the writer. Pilot surveys were made in five schools before the visitation to determine the adequacy of the questionnaire.

**SUMMARY OF FINDINGS**

The public senior high schools in Alabama which were included in this study did not generally offer subjects, extracurricular activities, general participation activities, or school-sponsored functions to their pupils free of charge. Pupils were required, expected, or socially compelled to pay various sums of money in order to participate in the total school offering. Per pupil expenditures for all school activities varied principally with the practice followed by the various schools in making available necessary materials, equipment, and other items of expense without cost.

The mean cost per pupil for attending the 61 selected senior high schools in Alabama was \$54.04 for senior I pupils; \$61.94 for senior II pupils; and \$136.86 for senior III pupils. The mean cost for all senior high school pupils was \$86.28.

Textbooks were required in practically all subjects. More than half of the subject cost was for textbooks. The highest subject cost was \$15.30 for typing; and the second highest was \$10.11 for vocational agriculture. The lowest subject cost was \$2.17 for driver education; and the second lowest was \$3.85 for bookkeeping. The mean cost for each subject was \$6.02. The highest cost reported for any ex-

tracurricular activity was \$149.00 for private music. The mean cost for each extracurricular activity was \$5.52. A limited number of activities were free. General participation costs were reported for admissions, general cost to pupils, and graduation cost. The mean per pupil cost for admissions was \$13.76, for general cost \$15.18, and graduation \$93.81.

**RECOMMENDATIONS**

1. Every senior high school in Alabama should make a careful and detailed study to determine as accurately as possible the cost to pupils of attending high school and the relation of cost to general school participation and attendance.
2. A program of interpretation of the total school program to the public to work toward lowering costs and ultimate elimination of all costs to pupils should be made. This would make possible more equal educational opportunities for all secondary youth.
3. Administrators should evaluate all extracurricular activities and eliminate those that are not educative or that involve excessive cost to pupils.
4. More local, state, and Federal support should be provided in sufficient amounts to eliminate pupil cost.

327 pages. \$4.20. Mic 56-2174

**EDUCATIONAL RECONSTRUCTION IN AN  
INDEPENDENT NIGERIA: THE AIMS  
AND OBJECTIVES OF THE SECONDARY  
SCHOOL CURRICULA**

(Publication No. 16,599)

Uduaroh Okeke, Ph.D.  
New York University, 1956

The purpose of this study has been to make a critical analysis and appraisal of secondary school curricula in Nigeria under British rule.

After many years of British colonial administration, Nigeria is finally moving toward self-autonomy. This transition has made it imperative that a study of this kind, which concerns itself with the role of education in a new Nigeria, be conducted; for in this period of social and political transition there is an urgent need for social reconstruction in which education would play a significant role.

It is assumed that secondary education in an independent Nigeria faces a new set of problems, as Nigerians living in an independent country, and as such there is a need for the reconstruction of secondary education relative to an emerging Nigeria.

Such a study conducted by a Nigerian has a special significance for Nigerians.

The investigator, pursuant to the problem chosen, made a study of social, political, economic, and religious needs of Nigerian society and derived educational objectives in terms of these needs; he made a critical analysis and appraisal of British colonial educational policy and practice in order to compare British secondary education in Nigeria to the needs of Nigerian society to see how this education measures up or down to these needs. As an invaluable guide, the investigator made a study of American education

in general and American secondary education in particular, and derived principles from its modern practices and philosophy.

The investigation led to the conclusion that British education in Nigeria was intended to train colonials, not citizens of a free nation; that British secondary education was intended for a few selected "upper crust" of Nigerians who thus would become "elite leaders" of the masses considered incapable of profiting from secondary education; that the secondary education curriculum, imported from England, rarely meets the needs of Nigerian society and "educated" Nigerians; that British secondary education in Nigeria follows double and triple tracks and, as such, tends to create or perpetuate a society based on social structure which, largely, uses as its criterion possession of school diploma or lack of it; and finally, that the overall orientation of secondary education in Nigeria is colonial in nature, thus subservient in character, and as such, has failed to produce a people who would assume responsibilities of free citizens in a free country. National unity and national self-determination in Nigeria has not been cultivated through British education for the reason that this education was not intended to build a strong and united Nigeria, bound by social cohesion rather than the imperial army; because such unity and social and political maturity would lead to expulsion of the British colonial power from a country which is considered one of the greatest assets of present British colonial possessions.

The investigator recommends a comprehensive high school where all Nigerian children would be taught principles of democratic living by actual participation and socialization in a democratic process operative at school—the common school. Such a school would provide a three-year course in general education to all youth, a one-year exploration course, and a two-year specialization course.

Meanwhile, educational control would be invested within the Nigerian communities which would meet to study their educational problems and design their educational curriculum consistent with their social and cultural environment. Such an education would be based on modern educational philosophy and practice and democratic principles which emphasize the value of an individual as a free agent capable of growth in intelligence, and able to further his own happiness and that of his neighbor and humanity.

310 pages. \$3.88. Mic 56-2175

#### A STUDY OF CERTAIN SYSTEM-WIDE ADMINISTRATIVE PRACTICES CONCERNING PHYSICAL EDUCATION IN THE PUBLIC WHITE SCHOOLS OF ALABAMA

(Publication No. 17,016)

James Shirley Owen, Ed.D.  
Alabama Polytechnic Institute, 1956

Chairman: W. Theo Dalton

This study was concerned with system-wide administrative practices for physical education affecting public white schools in Alabama. The primary purpose was to show the quantitative status of (1) practices employed in the systems and (2) opinions of the system su-

perintendents relative to these practices. This was done by comparing them with desirability ratings as established by authorities. A secondary purpose was to show the relationship existing between employment of desirable practices and each of the following factors: system enrollment size; type of system, i.e., whether it is a county or city system; mode of selecting county superintendents; percentage of pupils transported in the counties; and rate of local ad valorem tax.

A checklist containing 115 practices was distributed to all Alabama public school superintendents; eighty of the 111 replied. The same checklist was sent to twenty-eight authorities; nineteen rated each practice as to its desirability. Interviews were conducted in nineteen systems as a follow-up to the checklist. The findings were presented by number and percentage and by various statistical measures.

The major findings were:

1. Authorities classified sixty of the 115 practices as desirable. Fifty-seven of these were used in the statistical summary. The range of desirable practices employed in the systems was ten to forty-six. The mean was 29.42.

2. The typical system employed 63 per cent of the desirable curriculum practices. This was the highest percentage of desirable practices employed in any one area. The lowest was 33 per cent in the system policy area.

3. Eleven of the desirable practices were employed in 75 per cent or more of the systems; thirty-four were employed in 50 per cent or more.

4. Of the seventeen practices classified undesirable, only four were employed in more than 25 per cent of the systems. The range of undesirable practices employed in the systems was from zero to six. The mean was 2.34.

5. Superintendents' opinions as to desirability were better than current employment practices. Fifty of the sixty desirable practices were rated desirable by 50 per cent or more of the superintendents, while only thirty-four of the sixty desirable practices were employed in 50 per cent or more of the systems.

6. A bi-serial correlation of .64 in favor of city systems showed a tendency for city systems to employ more desirable practices than county systems.

7. Enrollment size seemed to have little relationship with employment of desirable practices in county systems as the correlations determined ranged from -.11 to .12.

8. Enrollment size seemed to have some relationship with employment of desirable practices in city systems. A bi-serial correlation of .39 favored the city systems with enrollments from 1,250 to 2,500. A bi-serial correlation of -.43 was found unfavorable to the six smallest systems.

9. Each of the three factors — the percentage of pupils transported in the counties, the mode of selecting the county superintendent, and the rate of local ad valorem tax — appeared to have only a weak relationship with employment of desirable practices. Correlations concerning these factors ranged from -.16 to .27.

203 pages. \$2.65. Mic 56-2176

SOME FACTORS OF ACADEMIC ACHIEVEMENT IN  
HIGH SCHOOL PUPILS ATTENDING SELECTED  
INDIAN BOARDING SCHOOLS IN OKLAHOMA

(Publication No. 16,764)

Charles Roderick Penoi, Ed.D.  
The University of Oklahoma, 1956

Supervisor: Dr. Gail Shannon

The Federal Indian boarding school has developed from a school that accepted all Indian students with one-fourth degree of Indian blood to one in which admission is based upon specific criteria set forth by the Bureau of Indian Affairs. This in turn has conditioned a certain type of pupil among the Plains tribes in the present day Indian boarding school.

The purpose of this study is to discover the effect of mental ability, personality and social environment upon the educational achievement of seventy-five Plains Indian pupils with similar cultural backgrounds from three Federal Indian boarding schools. These schools were: Riverside Boarding School, Anadarko, Oklahoma; Fort Sill Boarding School, Lawton, Oklahoma; and Chilocco Agricultural School, Chilocco, Oklahoma.

Data were secured through administering: the Revised Stanford Binet Tests of Intelligence 1937; the California Achievement Tests, Complete Battery Advanced, 9-14; the California Test of Personality, all levels, form AA; and personal interviews with pupils and administrators.

**The principal findings:**

1. In the comparison of pupil achievement with pupil ability it was found that 60 per cent of the 75 pupils had intelligence quotients ranging from 66 to 99, while 40 per cent had scores from 100 to 124. In the area of teachers grade averages 78 per cent scored 2.0 or above, while 22 per cent were below 2.0, or C. On the basis of the California Achievement grade placement 33.3 per cent of the group scored at their grade level or above.

2. In the comparison of pupil achievement with personality it was found that the majority of the pupils were below the 50th percentile in total personality adjustment scores, but had a teachers grade average of 2.0.

3. In the comparison of pupil achievement with social environment the tables reflect that 33 per cent of the pupils have parents living together, 27 per cent have divorced parents, and 40 per cent are half or full orphans. The majority of the pupils fell in the teachers grade average from 2.0 to 3.0, although 4 students with parents living together scored from 3.3 to 3.6.

While the curriculum of all Federal Indian boarding schools in Oklahoma is approved by the Department of Education of the state of Oklahoma, and much attention has been given to the actual needs of the pupils among the Plains tribes, certain areas need attention. Teachers should give continuous attention to the refinement of grading and evaluating techniques. Federal Indian boarding schools should give more attention to the relating of each factor of mental ability, personality and social environment to pupil achievement, and give continued attention in each of the schools to the program of guidance as a means of working with pupil achievement problems among the Plains tribes.

152 pages. \$1.90. Mic 56-2177

AN APPRAISAL OF THE TEN-HOUR SEQUENCE  
IN CASES AND CONCEPTS OF  
EDUCATIONAL ADMINISTRATION

(Publication No. 17,403)

William Frederick Staub, Ph.D.  
The Ohio State University, 1956

**Statement of the Problem**

Education 800M, or "Cases and Concepts of Educational Administration," was a seminar conducted at the Ohio State University during a period of two quarters, from January 5 to June 8, 1955. It was the purpose of the study to examine the degree to which this seminar offered a productive way in which to look globally at the area of educational administration by contributing to the development of the fifteen post-master's students who participated in the experience. The major hypothesis was that there would be increased understandings of, and further growth in, the following five specific areas:

1. Assessment of the background and potentiality of each student for a career in educational administration
2. Problem-solving in an actual school-community situation
3. Improvement of skills in administrative behavior
4. Extension of understandings and know-how of school operation
5. Further development and clarification of basic concepts and values in educational administration

**Procedure**

In January and June of 1955, the following instruments were used to test and retest the students: Summary of Field Experience Inventory, Leader Behavior Description Questionnaire, F Scale, Ideas about Myself Inventory, Problem Sheet, and Test of Professional Understandings in Education. In addition, content and process analyses were made of participant responses, which were recorded as written proceedings of each seminar session and plotted by the writer on the Bales Process Analysis charts. Additional data were taken from the students' written responses to various seminar assignments. These data were analyzed and interpreted as they applied to each of the five specific areas of the major hypothesis.

**Findings**

1. When each student rated his own experience on the Summary of Field Experience Inventory, both in terms of its extent and intensity, there were gains, during the seminar period, which were significant beyond the .01 level of confidence.
2. As measured by the F Scale, the students had strong antifascistic tendencies at the beginning of the seminar period. Also, the Ideas about Myself Inventory results indicated that they had a balance of leadership and followership characteristics. These mean scores showed only chance variations from January to June of 1955.
3. The writer recorded 3,312 responses during the seminar period and plotted them on the Bales charts. Of these, 62.3 per cent were made by the students and 37.7 per cent were made by the instructor.

4. A rank order correlation of .89 was determined when the patterns of oral problem analysis of the instructor and the students were compared.
5. When the Leader Behavior Description Questionnaire means were examined, a marginally significant shift, at the .05 - .10 level of confidence, occurred in the dimension Initiating Structure. During the seminar period, the difference between Initiating Structure and Consideration, the other dimension measured by the instrument, was reduced from 13.0 to 10.9, and this was in the direction which had been advocated as preferable administrative behavior.
6. Only limited evidence was found to indicate that the students increased their understandings of the area of school operation.
7. Of the 158 concepts and values in educational administration identified by the writer from the seminar proceedings and classified under 18 headings, 59.5 per cent were presented by the instructor, 29.7 per cent by the interdisciplinary guests, and 10.8 per cent by the students. A total of 58.2 per cent of these 158 were developed in process, during which the seminar participants were engaged in problem analysis, and 41.8 per cent were presented formally.

205 pages. \$2.70. Mic 56-2178

#### AN EVALUATION OF THE PROGRAM IN EDUCATIONAL ADMINISTRATION AT SYRACUSE UNIVERSITY

(Publication No. 16,665)

Alden Taylor Stuart, Ed.D.  
Syracuse University, 1956

An evaluation was made of selected aspects of the program in educational administration at Syracuse University. An original "Evaluative Instrument" was used in making a mail survey of opinions of two groups of Syracuse students: (1) 86 practicing administrators with a Syracuse Master's or Doctor's degree in educational administration, supervision, and curriculum; and (2) 46 individuals who had matriculated by the 1952 summer session and since that time had taken a minimum of six hours in educational administration or nine hours in any courses classified as administration, supervision, and curriculum.

The first part of the "Evaluative Instrument" collected data identifying the respondents. The other seven parts evaluated specific courses, methods of instruction, contributions of course work to areas of administrative responsibility, extent of training needed for selected areas of administrative responsibility, services provided by Syracuse University, reactions toward further graduate work, and needed improvements in the Syracuse program in educational administration.

For only a few of the forty individual courses listed were there statistically significant differences in evaluations of content or methods used.

More use was requested of all methods of instruction suggested, except for the lecture. More of the "problems

approach" was called for, along with workshops, individual conferences, internships, and opportunities for advice on such special problems as transportation.

Courses taken were rated by the practicing administrators as making at least a "fair" contribution to the twelve listed areas of administrative efficiency. Fewest respondents had taken course work in the two areas of "buildings and grounds" and "legal aspects of educational administration." Consequently, gaps in training were most frequently acknowledged in these two areas and also in "personnel administration," "school-community relations," and "special services."

Findings concerning certain recommended kinds and possible areas of training may have value in making the instructional services of colleges and universities more available and useful to people in the field. For instance, training for basic understandings in the area of "American and world influence on education," could best consist of courses of one or more semesters in length. In the area of "buildings and grounds," much can be done in preparing the administrator for effective leadership through the short intensive training found in the workshop experience. "Curriculum planning and development" is a field where the more extensive learnings are sufficiently great to demand the formal preparation characteristic of a full course of one or more semesters. Likewise with "growth and development."

For "legal aspects of educational administration," which represents a gap in the training of most administrators, the five-day workshop is considered by the respondents as offering definite training possibilities. But they think that "management in educational administration," can be learned effectively on the job or in a workshop program.

Training in "personnel administration" can be provided also through the workshop experience.

Services provided by Syracuse University which were rated highest were (1) library facilities, (2) student-teacher rapport, both within class and out-of-class, and (3) cultural opportunities. Parking facilities received the lowest rating.

The majority of those responding to Part VII indicated their intention of taking further work at Syracuse leading to advanced degrees. No evidence of complete dissatisfaction with the program was evident.

Comments of respondents were extremely interesting. Among them was the need expressed for the functional type of course from which specific skills of operation can be learned.

285 pages. \$3.66. Mic 56-2179

#### A SURVEY OF PRACTICAL NURSING AND PRACTICAL NURSE EDUCATION IN FLORIDA

(Publication No. 17,032)

William Ritchie Tilley, Ed.D.  
The Florida State University, 1956

Since 1950 the education of practical nurses in Florida has been a function of the public school system under the general direction of the State Department of Education. The purpose of this survey was to study and interpret the status of practical nursing and particularly the program for training practical nurses in order to give direction to future action concerning employment and training of practical nurses.

Data for the study were in the main limited to practical nursing activities in Florida from 1950 through 1954, although some historical background and pertinent data for 1955 were included.

Using questionnaires and interviews, samplings were taken from both graduate and non-graduate licensed practical nurses (LPN's), registered nurses, physicians, nursing supervisors, hospital administrators and others. The study contains analyses of 38 tables which summarize data concerning the personal characteristics of LPN's, their employment status, the functions they perform, their educational program and the numerical needs for LPN's. Sections of the study present the unedited comments of respondents.

The data for personal characteristics of the LPN's analyzed the race and sex, marital status, age, educational level, year and manner first licensed, and the number of dependents. In the sampling there was considerable variation in the types of employment of the graduates and the non-graduates. Doing institutional type work were approximately 71 per cent graduates and 45 per cent non-graduates. Doing private duty were approximately 9 per cent graduates and 31 per cent non-graduates. On inactive status were approximately 15 per cent graduates and 22 per cent non-graduates. Very few of the LPN's had any difficulty in finding all the work they wanted. Beginning salaries were approximately \$160 for graduates and \$150 for non-graduates.

Three out of four of the active graduate LPN's were working in general hospitals of over 100 beds and were usually the hospitals in which the LPN had received training. By comparison, only 39 per cent of the non-graduates reporting were working in hospitals of over 100 beds. Other details of services and shifts for LPN's are described and analyzed.

The analysis of 177 nursing functions of LPN's showed that 146 of the functions were either desirable or permissive for the LPN, in the opinion of LPN's, registered nurses, nursing supervisors, and physicians. The functions which were questionable centered around the giving of medications and complicated treatments. These functions were categorized in order to show more clearly what the LPN is doing and should be doing, in the opinion of the respondents. Much disagreement on the functions of the LPN was noted.

A study of the future needs for LPN's showed that by 1965 Florida may need approximately 14,500 LPN's compared with the 1955 supply of approximately 7,000. This means a great increase in the capacity of the educational program for training LPN's, because current licensure laws require that in order to become licensed, one must have attended an approved one-year training program or its equivalent.

The educational programs at twelve centers are described. Most of the training was conducted for a total of fifty-two weeks, with variations of pre-clinical, clinical, and vacation time. The manner of instruction was also studied. The lack of permanent and adequate housing was a great draw-back to effective instruction. The curriculum is described.

The general conclusions were that the LPN's are performing well those functions which they perform very frequently. There appears to be more strong points than weaknesses in the practical nurse program in Florida with much more desire and need for the program to continue

and increase than there is for it to be curtailed or abandoned. The place of the LPN on the nursing team and the detailed functions the LPN is to perform are not uniform in scope or acceptance but with more widespread information and greater understanding of her role the position of the LPN should become better recognized and accepted.

228 pages. \$2.95. Mic 56-2180

**A STUDY OF CERTAIN MEDIA OF  
COMMUNICATION BETWEEN THE  
SUPERINTENDENT AND THE FACULTY IN  
FIVE PAIRS OF ARKANSAS SCHOOLS  
(VOLUMES I AND II)**

(Publication No. 16,963)

B. Davis Warren, Ed.D.  
University of Arkansas, 1956

Major Professor: Paul V. Petty

**The Problem**

The problem was to collect and interpret certain data pertaining to communication within ten Arkansas public school systems, with emphasis on communication between the superintendent and the faculty, to be used in answering the question, "Are there observable differences in the communication within the staffs of certain schools that are recognized as good and others that are recognized as weaker?"

Among the secondary related questions for which answers were sought were:

(1) Is there an awareness in the public school of the importance of communication in its three-way aspects--administrator to faculty, faculty to administrator, and among the faculty?

(2) Are the basic purposes of communication being achieved in the selection and use of the principal media of communication employed between the superintendent and the faculty?

(3) What is being done by the administrators and the faculty to study the problems of communication and to improve the communication if improvement is needed?

The media studied included bulletin boards, bulletins, handbooks, information gathering devices, the inter-communication system, memos, news releases and publicity, conferences, faculty meetings, interviews, and overall communication.

**Procedures Used**

Ten school systems ranging in faculty size from forty-three to twenty-three were selected and paired. Each of the five pairs was made up of schools similar in size and organization but differing in the rating given by the state and regional accrediting agencies and in other factors recognized as possible determinants of the quality of the school.

In order that the quality of communication in the two groups of schools (the good and the weaker) might be compared, a survey instrument was devised to determine discriminating differences in practices, opinion, and related attitudes.

Ten superintendents and 251 teachers (84.8 per cent of the teachers in the systems) took part in the study.

#### Conclusions

From a study of the responses to the items of the Checklists, it was found that there was no significant difference between the quality of communication in the two groups of schools. However, the group composed of the weaker schools received the higher average on 83 of the 122 rated items of the Checklists. Conclusions reached from the findings on the use of the various oral and written media studied included the following:

(1) The state and/or regional rating of a school was not a significant indication of the quality of communication between the superintendent and the faculty in that school.

(2) The basic purposes of communication are not being achieved to a very high degree through the use of the principal media of communication employed between the superintendent and the faculty.

(3) Administrators and teachers are not aware of the importance of communication as an element in the realization of the groups' goal--the education of the youth of today. However, a number are concerned about the problem.

(4) A large number of teachers have a desire to help plan their faculty meetings.

(5) Group study within the faculty is needed on group discussion techniques.

(6) Face-to-face relationships are very important in communication within public school faculties.

(7) If an organized public relations program existed in the schools studied, the teachers, in general, were not involved in it.

370 pages. \$4.75. Mic 56-2181

tablished through analysis of data secured in the manner indicated above. First, emergent principles for educational planning were established through analysis of a concept of democratic planning. Next, the social nature of planning was examined through analysis of the areas of group dynamics and social process theories of curriculum development. Third, basic elements and practical criteria for educational planning were developed through analysis of data on planning experiences in fifteen school systems. Finally, through analysis of data secured in the study of authoritative judgments, factors involved in educational planning were formulated into major categories of objectives, procedures, content, and principles.

Through a synthesis of data secured from the analyses of the study, a theoretical guide to educational planning was stated. The analyses indicated that principles adequate for guiding the process of educational planning must be dynamic and flexible rather than static and uniform. Five relevant conclusions about the process were reached: complex factors are involved; the factors are interrelated; the factors are dynamic and changing; complex patterns of human relations are involved; and the situation in which planning takes place is unique for each planning experience. In stating a theoretical guide, the following topics were covered. First, the process was defined and basic objectives were stated which envisioned the process not only in its application to immediate problems but also as a means for securing long-range growth within the school system. Second, eight categories of procedures in the process were characterized, and major areas of content were indicated. And third, to place the elements of planning in comprehensive perspective, four operational perspectives for the process were described: the planning situation as a configuration of dynamic forces; planning as a process of social change; planning method as the application of social intelligence to practical problems; and a set of guiding principles for the process.

Thus educational planning was viewed as a process of multi-dimensional complexity, totality, and situational uniqueness. An approach to the application of the theoretical guide in practical situations was stated; and possible applications of some of the basic concepts in other areas of educational planning were urged. Also included is a bibliography containing numerous references helpful in applying the concepts of the study.

228 pages. \$2.85. Mic 56-2182

#### EDUCATIONAL PLANNING FOR SCHOOL PLANT CONSTRUCTION

(Publication No. 16,608)

Edward Leroy Whigham, Ph.D.  
New York University, 1956

Schoolhouse construction in the United States is at record levels. Yet rapidly increasing enrollments and the nature of existing plants indicate that an even greater volume of construction must be provided if adequate physical facilities are to be provided. If these buildings are to serve educational purposes satisfactorily, there is a need for a clear and consistent understanding of the process by which school plants are planned and designed. The present investigation was undertaken in relation to this need.

The purpose of the study was to develop a theoretical guide to educational planning for school plant construction. Data were secured from analyses of resources in the related literature, from study of planning experiences in fifteen school systems, and from judgments of a selected group of authorities in the field of school plant planning. Interviews and observations were used in studying planning practices in the fifteen systems; and the jury technique was used in collecting authoritative judgments. Appropriate instruments were developed for the purpose of collecting these data.

Principles for a theoretical guide to planning were es-

#### A DESCRIPTIVE STUDY OF THE CPEA CLINICS IN ARKANSAS BASED UPON AN ANALYSIS OF OPINIONS OF ADMINISTRATORS AND TEACHERS WHO PARTICIPATED

(Publication No. 16,964)

Warren A. Wilson, Ed.D.  
University of Arkansas, 1956

Major Professor: Paul V. Petty

The purpose of the study was to describe the Arkansas CPEA clinics in school administration based upon an analysis of opinions of administrators and teachers who participated. A brief description of the actual activities was

given. A survey instrument was prepared, which listed items related to operational aspects and purposes of the clinics with appropriate blanks for those participating to indicate their opinions concerning the results achieved.

All school administrators who had participated in clinic activities were included in the study. A sampling of teachers from host schools was also included. The clinic program of activities consisted of 39 school administration clinics, held during the four-year period, beginning in 1951, and ending in August, 1955.

Of the 276 school administrators included in the study, 223, or 84.4 per cent, responded by completing and returning the survey instrument. Only 53, or 53 per cent, of the teachers included in the study completed and returned copies of the survey instrument.

**Findings.** The findings of the study revealed that: (1) the study and survey session was considered to be the session most beneficial to participants; (2) each of the five clinic sessions made some contribution to professional growth; (3) the limited amount of time allowed for clinic activity was considered a weakness of the program; (4) the clinics furnished ideas for improvement to participants; (5) the clinics to some extent stimulated professional reading; (6) the clinics provided opportunities for participants to exchange ideas; (7) the clinics created community interest in the host school; (8) the participants approved and appreciated the help received from consultants; (9) the materials developed were usable in the schools represented; (10) the clinics stimulated attendance at meetings of professional organizations; (11) the clinics exerted influence on areas of suggested improvement; and (12) the clinics provided data for research.

**Conclusions.** The findings of this study supported the following conclusions: (1) school administrators welcome an opportunity for visiting other school systems comparable to theirs; (2) school administrators thought clinics in school administration provided professional growth opportunities; (3) the organizational plan of clinic activities was good within the limitations imposed; (4) school administrators appreciated an opportunity to get together to exchange ideas with others; (5) the clinics in school administration furnished practical ideas for improvement which could be implemented; (6) community interest in host schools was stimulated by clinic activity; (7) the consultant services provided were adequate; (8) the materials prepared and used in clinic activity were suitable for the program; (9) some form of follow-up activity resulting from clinic study was needed; (10) the clinic was a cooperative effort and was helpful to all groups involved; (11) the clinic schedule did not allocate sufficient time for the study and survey session; and (12) proper planning was a necessary step in the study or inservice program.

**Recommendations.** On the basis of the findings of this study it is recommended that: (1) clinics in school administration as used in Arkansas, or activities similar to the clinics, for professional improvement of educational administrators, be continued; (2) greater participation in inservice activities similar to those of the clinics should be encouraged by school personnel and lay groups; (3) the clinic approach should be expanded to include and provide for more advance planning and publicity at the local level; (4) a follow-up activity should be developed that will, (a) continue professional growth activities of school personnel, (b) continue and maintain the community's interest in schools, and (c) provide evaluation of clinic activities; and

(5) the State Department of Education, University of Arkansas, and the Arkansas School Administrators Association should continue cooperative activities for the professional growth of school personnel in Arkansas, with time allowed representatives to work more closely with local schools in planning inservice activities.

169 pages. \$2.25. Mic 56-2183

## EDUCATION, ADULT

### A STUDY OF THE NEED FOR THE EXTENSION AND IMPROVEMENT OF THE ADULT EDUCATION SERVICES OF THE OHIO STATE UNIVERSITY

(Publication No. 17,402)

John Allen Spence, Ph.D.  
The Ohio State University, 1956

While the Ohio State University is conducting a large number and variety of general adult-education activities (the term general referring to all adult-education activities which are not a part of the institution's Smith-Lever agricultural and home economics extension service), they are largely uncoordinated and are deficient in various respects as compared with the programs carried on by most other land-grant universities. The purpose of the dissertation is to arrive at certain principles and recommendations which will serve as guidelines for the sound development of the Ohio State University's general adult-education programs and services by a study of the educational needs of adults in Ohio; the philosophical, historical, and legal responsibility of the University in this field; the institution's peculiar characteristics and its relationships with other educational institutions in the State; and the comparison of its adult program with those of other universities.

The writer surveyed the literature of higher education, university extension, and adult education to obtain information concerning the historical development and current status of adult-education services in American universities and the educational needs of adults which universities should serve. To supplement these data, he interviewed general extension personnel of four land-grant universities having large general extension programs. The archives of the Ohio State University were researched for information about the origin and development of adult-education activities at that institution. Information concerning their current status was obtained by interviewing Ohio State University staff members and utilizing recent faculty-committee studies. United States census reports and other published materials yielded information concerning the peculiar characteristics and relationships of the Ohio State University and the state of Ohio which held particular implications for adult education activities.

Logical implications drawn from the data obtained in the preceding steps, supplemented by pertinent philosophical quotations and faculty committee recommendations, indicated that the principal functions of the Ohio State University in extending education to adults should be: (1) to provide opportunities for adults to pursue, on a part-time

basis, formal programs of education leading to diplomas, certificates, or degrees; (2) to provide informal programs of continuing liberal and general education; (3) to provide adults with vocational or professional education for refresher or upgrading purposes; (4) to train teachers and leaders in adult education; and (5) to provide counseling, information, and related services for individuals and community groups. Major areas of educational service for adults which appeared to warrant considerably more attention by the University than they had been receiving included part-time terminal programs, graduate degree programs, programs of liberal and general education, and professional training for teachers and leaders in adult education. Indications were that the institution should be much more concerned than it is at present with the educational needs of groups that are not adequately represented, and that more attention should be given to geographical areas of the State in which adults are not being adequately served by other higher educational institutions. Among the recommendations made with a view to the sound development of the University's adult education program were: (1) a university-wide extension organization; (2) special budgetary provisions for adult-education activities; (3) criteria by which to determine the appropriateness of proposed activities; (4) a campus facility specifically designed for housing conferences and short courses; (5) coöperative relationships with other colleges and universities in Ohio; and (6) closer relationships with the users and potential users of adult-education services. Possible solutions to these needs and others disclosed by the study are discussed.

274 pages. \$3.55. Mic 56-2184

#### EDUCATION, HISTORY

##### ATTITUDES OF SELECTED RACIAL LEADERSHIP ORGANIZATIONS TOWARDS EDUCATIONAL POLICIES AND PRACTICES FOR NEGROES DURING THE TWENTIETH CENTURY

(Publication No. 17,417)

Herman Hollis Bozeman, Ed.D.  
University of Michigan, 1956

This study reveals the dominant attitudes which characterize the nature and extent of the educational concern of two interest groups, namely: the National Urban League and the National Association for the Advancement of Colored People. These groups are cited as "racial leadership" groups in recognition of the specific orientation of their master programs which derive their justification-for-being from the existence of certain disabilities peculiar to Negroes as a racial group in the American society.

Basic attitudes are sought through the educationally related activities approved and sponsored by the organizations, and the pronouncements of key personnel recorded in the official literature of these organizations, 1910 to 1954. Historical and descriptive research methods are primarily relied upon in an effort to present an intensive and longitudinal view of the pertinent aspects of the problem.

The master programs of the selected organizations are revealed to be intricately involved with efforts to modify policies and practices affecting the educational opportunities of Negroes as a racial group. Of special significance is the National Urban League's pioneering role in making available social work training opportunities for Negroes, and in the employment of visiting teachers for predominantly Negro school situations. It has been a potent factor in seeking to get school vocational programs geared more to the needs of workers, especially those in modern industrial areas, and to facilitate the improvement and functional adequacy of school vocational guidance counseling programs. At times, this organization is shown to be highly critical of certain school policies and practices, including the vocational offerings of many Negro industrial schools, and of vocational counselors who would restrict the vocational aspirations of Negro youths to jobs having a tradition of accepting members of their group.

The primary educational attitudes of the National Association for the Advancement of Colored People are apparent in its efforts to seek certain "equalities" of opportunities for Negroes as compared with those available for members of the dominant group in the American society. These "equalities" have reference to: the length of school terms, pay for equally qualified teachers doing similar work, transportation provided school children at public expense, buildings and equipment, per capita expenditures for education, graduate and professional training opportunities; and educational opportunities on all levels on a nonracially segregated basis.

On the whole, both organizations have favorably adhered to the generally accepted purposes and philosophy of American education, and have sought to cooperate with efforts for their implementation. However, it is apparent that the primary educational concern of these organizations is predicated upon their perception of the implied potential and efficacy of formal education as an instrument for racial up-grading in the American society.

The selected organizations vary somewhat in their approaches for implementing their respective objectives. The National Urban League's efforts tend to be characterized by more indirection, less militancy, and by a conspicuous reliance upon interracial good will and interracial cooperation. The National Association for the Advancement of Colored People's program is better characterized by its more direct approach, its vocal militancy, and its persistent utilization of the courts as an instrument to facilitate desired modifications in aspects of educational opportunities for Negroes.

The records of both organizations are replete with evidences of cultural maladjustments and disabilities confronting Negroes as defined and articulated by the leadership of these organizations. An awareness of such information is recommended as of particular value to those entrusted with the responsibilities for determining educational policies and practices for school situations in which Negroes constitute a part of the population.

325 pages. \$4.20. Mic 56-2185

## EDUCATIONAL CHANGE IN SIERRA LEONE

(Publication No. 17,426)

Edward Paul Coleson, Ph.D.  
University of Michigan, 1956

The purpose of this research is to study the factors involved in the development of an educational program most appropriate for the people of Sierra Leone, West Africa. Since the assumption is made that the educational pattern should be suited to the total environmental complex and that all aspects of life are to be considered pertinent to the problem, the several chapters describe the natural environment, the social organization of both the Colony and the Protectorate, the problems of health and economic development, and the impact of past and present educational arrangements.

As sources the author used the standard works on Sierra Leone; government documents obtained in Freetown, in London, and from the British Information Service; and books and periodicals issued by the mission boards which have worked there. The author also spent nearly three months in Sierra Leone, observing the country and interviewing people in all walks of life.

Although the study is concerned primarily with the modern scene and future needs, the historical background of present day problems is traced. In view of the stated purpose the several educational plans and arrangements tried through the years in Sierra Leone as well as proposed plans for educational and economic development for the future were investigated through the literature and experience in the field. In addition to programs already used or proposed for the country, the writer studied the possibility of using the well established and formulated concept of Fundamental Education as a possible means of promoting educational progress and development in the country.

The investigation revealed that the traditional British educational system has proved to be inadequate (95% of the people of the Protectorate are still illiterate), is already constituting a serious economic burden although so few are benefiting from it, and tends to form an educated elite, separated from its people, and unwilling to work except at what are regarded as professional jobs. The nationalist People's Party has proposed a vast extension of the system, but the resources for an all-inclusive educational program along the present lines are not apparent. In the meantime health, agricultural, and governmental problems become acute because the people are unprepared to cope with them in a fast-moving world. A literacy program started in the hope of quickly providing literacy for all the people in the vernacular has made little progress, although it appears feasible.

It was concluded that Fundamental Education as promoted by Unesco has possibilities as a means of resolving this educational dilemma. As Fundamental Education is consciously adapted to the people in their distinctive environment and in terms of every day needs, it is hoped that it would be possible by this technique to teach the minimum essentials necessary for development without prohibitive cost or further cultural disintegration.

357 pages. \$4.60. Mic 56-2186

THE CRAFTSMEN OF COLONIAL NEW YORK CITY  
(PARTS ONE TO SIX)

(Publication No. 16,621)

Paul Zankowich, Ed.D.  
New York University, 1956

Chairman: Professor William P. Sears, Jr.

The purpose of this investigation was to study the life and the work of the craftsmen of colonial New York City, and the social and political environment in which they worked, from the time the Dutch gave up the city to the English, through the period of the Revolution, to the turn of the nineteenth century. The study was planned to provide resource material for teachers, especially of the industrial arts and the crafts in the areas of woodwork, metal work, the graphic arts, ceramics, textiles, and the crafts in general. The basic theme underlying the study was the appreciation that New York City experienced a rising and flourishing craft culture during the period under study.

The study is introduced by a picture of the political, social, and civic life in the city during the days of British rule. Thus the environment in which the craftsmen lived and worked is described. Following this is an account of the craft life of the city. Data were secured from such prime sources as the newspapers of the day, the journals and ledgers of the craftsmen, and bills, letters, and wills. Examination was made of previous studies in the field.

After recounting the working environment and the daily problems of the craftsmen, the study provides sections on such auxiliary aspects of craft life as the source of supply and the training of competent workmen, the career and contribution of the master cabinetmaker Duncan Phyfe, and the building and ornamentation of St. Paul's Chapel, the only public edifice remaining and functioning in its original way in the city.

Among the generalizations made upon the data secured are the following: under the Dutch rule, when the city was little more than a tiny village on the tip of Manhattan Island, the germs of a craft culture existed; after the arrival of the English, as the city grew and prospered, the crafts developed and prospered, too; in the early years of the eighteenth century, English craftsmen began to arrive and set up their shops and train apprentices. These craftsmen were constant advertisers in the newspapers and their advertisements boasted of their skills. Their products, they declared, were as good, if not better, than those of Europe. Many of these craftsmen conducted, in addition to their manufacturing enterprise, retail shops in which they sold imported goods of all sorts. As the Revolution drew on and as critical event followed critical event, the craftsmen were frequently involved as a group in the affairs of the city. The investigation also reveals that the apprenticeship system, patterned upon medieval English practice, was a major source utilized for the training of youth for the trades. The arrival of skilled workers from the Old World, also, furnished a corps of trained workers.

The study concludes at about the turn of the eighteenth century. By this time the seat of the new Federal Government had been transferred to Philadelphia and New York was no longer the nation's capital. The Federal Period had begun and new forces were affecting the culture and economic life of the country. It is pointed out that after 1800 the importance of the craftsmen was a lesser one in New

York. Soon would come the opening of the West, the building of the Erie Canal, the growth of the merchant marine, and the development of the factory system and the beginnings of mass production technics. The investigator suggests further studies to assess the impact of these events on the once-thriving craft culture.

614 pages. \$7.68. Mic 56-2187

#### EDUCATION, PHYSICAL

##### A SURVEY OF HEALTH AND PHYSICAL EDUCATION PROGRAMS IN THE PUBLIC ELEMENTARY SCHOOLS OF OHIO BY MEANS OF THE LAPORTE SCORE CARD

(Publication No. 17,415)

Ralph Edwin Billett, Ed.D.  
University of Michigan, 1956

The purpose of this study is to determine the status of elementary school physical education programs in the state of Ohio through the application of LaPorte's Score Card No. I to a random sampling of two hundred schools. Since similar studies are to be made in the various states of the United States, this study is of both state and national significance. The anticipated outcomes are that it will provide an objective account of the scope of the elementary school physical education programs in the state, and will alert those involved in elementary school physical education to the weaknesses and strengths of present programs, and will specify the ideal standards for good programs.

The 2,935 elementary schools of Ohio containing grades from one to six were grouped according to the factors of school enrollment and school valuation into categories designated as cells. Two hundred schools were next drawn from a table of random numbers and the number of schools drawn from each cell was in proportion to the percentage of schools represented by that cell of the total number of elementary schools in the state of Ohio. Upon the completion of the sampling, several trial evaluations of schools were made and compared with similar evaluations of a colleague. Skill and reliability of applying the score card was achieved through discussion and comparison of differences in scoring. After satisfactory agreement in evaluation method and after careful study of the score card, the two hundred schools were surveyed by the interview-visitation method.

Part I of the study, a graphic portrayal of the data concerning the evaluation of the two hundred elementary schools by LaPorte's Score Card was made. Maps of the state show the geographical distribution of the sample schools, the grade organization of the schools, and the total scores of the individual schools. Graphs present the comparative scores for all schools and for the city schools in contrast to the county schools.

In Part II of the study, a statistical analysis of the data was completed. The total scores for all schools, the scores by divisions of the score card, and the individual items were studied by item analysis and by mean scores. It was evident that increased enrollment and increased val-

uation contributed to improved physical education programs.

Wide variation was evident among the schools of the study. The total scores ranged from eight to one hundred and thirty-five points of the possible one hundred and fifty points, and there was an accompanying wide range of compliance with the individual items of the score card. The numerous specific conclusions concerning the various aspects of the elementary school physical education programs stem from the basic conclusion that the programs in the elementary schools of Ohio as measured by LaPorte's Score Card, with few exceptions, were very poor and in many cases non-existent.

186 pages. \$2.45. Mic 56-2188

##### THE STATUS OF PHYSICAL EDUCATION PROGRAMS IN SELECTED PUBLIC ELEMENTARY SCHOOLS IN SOUTHERN NEW JERSEY: AN EVALUATION OF PROGRAMS BASED ON CURRENT TRENDS AND VALIDATED PRINCIPLES

(Publication No. 16,620)

Evelyn Margaret Reade, Ed.D.  
New York University, 1955

#### Statement of the Problem

This study is concerned with programs of physical education in grades one through six in certain public elementary schools located in seven southern counties of New Jersey. The status of the programs and factors which influence them were studied. The programs were evaluated to ascertain needs. This evaluation was based on current trends in physical education and validated principles of physical education for elementary schools.

#### Method and Procedure

The survey method was used in the study. Program status and certain factors influencing the programs were obtained by means of questionnaires and checklists which were substantiated by curriculum validation. Additional factors which had influence on the programs such as climate, class size and state laws were also studied and discussed.

Stratified sampling was used to select the schools in the area for the survey based on factors of types of schools, enrollment, geographic location, grade level, and cost of education per pupil. Fifteen per cent of the schools were surveyed based on the above sampling factors.

Data used in the study were obtained from fifty-five public schools, four hundred and fifty-seven classroom teachers and fifty-two supervisors.

Trends in elementary education which directly implicate physical education and specific trends and developments in elementary physical education were obtained from current literature, periodicals and writings of leaders in the fields of elementary education and physical education.

Principles were validated by means of documentary literature, research, bulletins and publications by the leaders in the fields of elementary education and physical education.

#### Summary

In this study the personal data from classroom teachers reveals their education, experience, and specific courses

completed to aid them in teaching physical education. Further data from them reveals available equipment and facilities, class organization, time allotment, correlation and integration of physical education with other parts of the curriculum, the noon and recess programs, types of activities taught to each class and supervisory assistance. Teachers also state their needs and ways they believe they may best be met to aid them with functional programs of physical education.

The evaluation of programs based on eight current trends and developments in elementary education and physical education and twelve validated principles reveal the following findings and conclusions.

#### Conclusions and Findings

1. Approximately all schools surveyed include some type of physical education activities for thirty minutes in their daily programs.
  2. Seventy-two and eight-tenths per cent of the four hundred fifty-seven classroom teachers who cooperated in the study are responsible for their entire program of physical education.
  3. Teachers and supervisors agree in the most part there is need for assistance to plan, administer and execute programs of physical education for the elementary children in the schools studied.
  4. Activities in many instances appear not to be planned to meet the needs, interests and abilities of the children, nor does there appear to be much carry-over for leisure time during the noon and recess periods.
  5. Evaluation of programs is made mainly by subjective judgment.
  6. Factors of the classroom teachers' experience, education and attitude, and supervisory assistance appear to have influence on the programs.
  7. Camping education is not present in the schools in the area studied.
  8. There appears to be little correlation and integration of physical education with other parts of the curriculum.
  9. Schools are urgently in need of indoor facilities and equipment for both indoor and outdoor programs.
  10. There are no programs planned for the atypical child.
- 310 pages. \$3.88. Mic 56-2189

#### **EDUCATION, PSYCHOLOGY**

##### **A STUDY OF PREDICTING ACADEMIC SUCCESS IN ELEMENTARY SCHOOL READING FROM PROJECTIVE TESTS**

(Publication No. 16,968)

Robert Bain Bailey, Ed.D.  
The University of Oklahoma, 1956

Supervisor: P. T. Teska

The purpose of this study was to determine the value of certain projective techniques in differentiating readers from non-readers. The House-Tree-Person, the Machover

Draw A Person, and the Goodenough Draw A Man tests were used. The experiment was designed to establish the relative effectiveness of these projective techniques and to determine the role of training and background on the part of the interpreter. Subjects were at the second, fourth, and sixth grade levels. Teachers with some special training and teachers without special training were included as the experimental and control groups. The following hypotheses were tested: (1) that there is no statistically significant relationship between the selections of readers and non-readers and the procedure of basing the selections upon the analysis of the three specified projective tests; (2) that there is no statistically significant relationship between the selections of readers and non-readers and the particular drawing analyzed in making the selections; and (3) that there is no statistically significant relationship between the selections of readers and non-readers from the three specified projective tests and the training of the selectors.

The Experimental Teachers and the Control Teachers selected the readers and the non-readers from the drawings of a woman, a man, a house, and a tree at the three grade levels. The drawings were completed by the five most proficient and the five least proficient students in reading at each grade. The data is analyzed by the chi-square statistic. Hypotheses are rejected at the .05 and better levels of confidence.

The data obtained by this procedure indicate that certain drawings used in making the selections were of statistical significance for each group at each grade. The data also indicate that at the second and fourth grade levels, the Experimental Teachers selected significantly more readers and non-readers than the Control Teachers. These instances of selections at a number that exceeds significantly that of chance variation indicate that the three specified projective tests can be used to predict readers and non-readers in an elementary school. The data of this study indicate the following facts: (1) the three specified projective tests can be used to predict readers and non-readers; (2) that certain drawings are more effective in increasing the number of correct predictions; and (3) training can increase the number of correct predictions.

131 pages. \$1.75. Mic 56-2190

#### **THE EFFECT OF COUNSELING ON A GROUP OF EIGHTH-GRADE UNDERACHIEVERS**

(Publication No. 16,504)

Samuel Reed Calhoun, Ed.D.  
University of Pittsburgh, 1956

The aim of this investigation was to assess the effects of a program of individual counseling in a group of eighth-grade pupils classified as scholastic underachievers.

A group mental ability test was used as the measure of capacity; attainment was measured by a standardized achievement battery. Scores from both tests were converted to age equivalents, and the difference, where it favored mental age, was designated underachievement.

From the total population, pairs of pupils matched on the bases of sex, chronological age, intelligence quotient, and degree of underachievement were drawn to establish equivalent control and experimental groups. At least three

conferences were held with each member of the experimental group during the year. In these interviews test results were interpreted by the counselor, and the pupils were encouraged to develop plans to alleviate their underachievement based on their own analyses of the reasons for it. Pupil evaluation of the effectiveness of plans made also took place in the later contacts.

At the end of the experimental period another form of the achievement battery was administered to the eighth grade; results from it were the basis of one set of comparisons between control and experimental groups. The relative standings of the two groups on school marks and on personality ratings by teachers were also investigated. Significance of obtained differences in the means of the two groups was tested by calculation of *t*-ratios.

From the initial testing results it was evident that large negative differences between performance and capacity were considerably more frequent at the upper end of the intelligence scale. This was reflected in a somewhat higher level of ability in the groups of selected underachievers than in the total eighth grade. No one factor was designated as a possible cause of their underachievement by a majority of pupils; the two possible causes named most frequently had to do with lack of study and difficulty with one or more specific subjects. Furthermore, the individual pupils characteristically named more than one possible reason for the lag in achievement. Plans made by pupils to alleviate underachievement showed a tendency toward greater specificity as the interviewing progressed. Comparisons of the control and experimental groups on the second achievement test revealed, in general, an advantage for the experimental group that failed to reach statistical significance. The superiority of the experimental group on school marks was statistically significant in two of five report periods during which the counseling program was in operation; for the five report periods as a whole, school marks for the experimental group were better by a statistically significant margin. Ratings of pupil interest in school work by major subject teachers for the experimental group were higher than those for the control group during the counseling period; this difference also was statistically significant.

With respect to the effect of the counseling program on the achievement of the experimental group, it was concluded that some improvement had resulted. The inconsistency between the findings from achievement test results and school marks was deemed the outgrowth of the greater sensitivity of the latter to current changes in level of performance. Another effect seemed to be an increase of interest in school work. From impressions gained during the interviews, it appeared that, with this group at least, scholastic underachievement typically arose from a complex of factors and had to be dealt with on a highly individualized basis.

199 pages. \$2.49. Mic 56-2191

#### THE MANNER IN WHICH TWO SAMPLES OF NINTH-GRADE GENERAL SCIENCE STUDENTS ANALYZE A NUMBER OF SELECTED PROBLEMS

(Publication No. 16,587)

Edith Grossman Chess, Ph.D.  
New York University, 1956

This study investigated the manner of analysis of three problems in each of three categories of experimental problems, science demonstration problems, science life story problems, and social life story problems, by two samples, each of ten ninth-grade general science students. A wire recorder was used to secure the verbatim records of individual problem interviews. Subsequent to preliminary practice sessions devoted to developing facility in "thinking out loud", each problem interview included the following structural phases: personal check of the subject, presentation of the problem situation, subject's statement of the major problem he saw, presentation of the common major problem in the event of a difference between the subject's stated problem and the commonly accepted one, investigator's direction to analyze the common major problem, uninterrupted subject introspection, investigator guided retrospection, and association.

The results of examination of the one hundred and eighty verbatim protocols secured in the study, led to insights into the manner in which analysis had occurred. Consistent major findings in both samples indicated that inter-problem fluctuation of individual analytic rank was characteristic of all subjects. This individual fluctuation suggested that a number of variables seemingly making for differences in the manner of individual analysis had been operating. These variables seemed to relate externally to the nature of the experimental problem and internally to the nature of the subject. The problem related variables were seemingly those of content and presentation form. The subject related variables were seemingly those of a number of intrinsic forces operating during analysis of the problems. The forces identified were those of individual-problem identification, use of language, statement of the major problem, use of the analogy, mind set, patterns of thought, problem preferences, curiosity, imagination, external perceptual source area, number of memory sources utilized, and organization during analysis.

Comparison of the most successful with the least successful analytic protocols indicated common analytic features as well as a number of apparent differences in the manner of thought during analysis. Comparison of success in analysis with other measured traits indicated that female subjects were more successful in problems with social content; male subjects were more successful in problems with science content. Success in analysis also seemed to be broadly related to the IQ, Primary Mental Abilities, and Reading Achievement, although individual exceptions were noted in the higher, lower, and median ranks for all three measures.

Consistent major findings in both samples also suggested that: normal ninth graders probably could analyze a variety of problems unassisted; their manner of analysis would probably resemble that of the subjects; equivalence of mental products may not imply equivalence of mental process; demonstration problems may not necessarily be most conducive to optimal problem solving for all ninth-graders; mass instruction is not likely to improve individ-

ual analytic facility; past class common objective experience may differ from individual subjective recall of the common experience; individual preliminary problem definition by the teacher, even if thoughtfully done, may be less effective than collective class definition; "inferior" learners may be "different" learners; empathy rather than sympathy may be needed to help individual problem solvers improve; the IQ is not necessarily an infallible guide to likely analytic performance of individual subjects; deficiency or failure in problem solving may be caused by factors related to poor analysis.

Implications also emerged regarding likely psychological relationships between the phenomena observed during analysis and a theory of physiological mediation of mental phenomena. In view of the desirability of experimentally examining the conclusions and hypotheses, a number of recommendations for future research projects were suggested.

442 pages. \$5.53. Mic 56-2192

**A STUDY OF PREDICTIVE EMPATHY AND THE ABILITY OF STUDENT TEACHERS TO MAINTAIN HARMONIOUS INTERPERSONAL RELATIONS IN SELECTED ELEMENTARY CLASSROOMS**

(Publication No. 17,428)

Philip Diskin, Ph.D.  
University of Michigan, 1956

This study was basically concerned with an exploration of predictive empathy and its relation to the ability of student teachers to maintain harmonious interpersonal relations in the classroom. The study of empathy is of special importance in educational theory and practice. It may function as a basic factor in teacher effectiveness. It is assumed that harmonious interpersonal relations in the classroom are desirable and that the empathetic ability of the teacher is elemental to the initiation and maintenance of such relationships.

This study explored the following relationships:

1. Individual predictive empathy skills of student teachers and their ability to maintain harmonious interpersonal relations in the classroom.

2. Group participant observer empathy skills of student teachers and their ability to maintain harmonious interpersonal relations in the classroom.

3. Individual predictive empathy skills of student teachers and their group participant observer skills.

Also explored were (1) the factor of student teacher sex and accuracy of prediction, and (2) the factor of student teacher assumed knowledge of pupil predictees and accuracy of prediction.

The procedure involved each class of pupils rating themselves on the Detached Observer Scale, especially developed for this study. This scale was designed to obtain a measure of the pupils' feelings about themselves. Pupils also rated their student teacher on the Participant Observer Scale, also especially developed for this study. This scale was designed to measure pupils' feelings toward their student teacher. In turn, each student teacher predicted for five pupils selected at random how these pupils would rate themselves and how they would rate the student teacher. The following types of scores were obtained from this design:

1. Affective Rating: The mean rating which the class gave the student teacher on the Participant Observer Scale.

2. Detached Observer Score: A measure of the discrepancy between the pupils' actual rating of themselves and the student teacher's prediction of how they would rate themselves.

3. Participant Observer Score: A measure of the discrepancy between a pupil's rating of the student teacher and the student teacher's prediction of that rating.

4. Group Participant Observer Score: A measure of the discrepancy between the actual affective ratings (mean score) made of the student teacher by the pupils in the class and his prediction of that mean rating.

An analysis of the variables demonstrated that the ability to maintain harmonious interpersonal relations in the classroom was statistically associated with (1) detached observer plus participant observer skill ( $r=.39$ ), (2) detached observer skill ( $r=.28$ ), and (3) participant observer skill ( $r=.36$ ).

The ability to maintain harmonious interpersonal relations in the classroom was not statistically associated with group participant observer skill ( $r=.16$ ).

Group participant observer skill was not statistically associated with (1) participant observer skill ( $r=.18$ ), (2) detached observer skill ( $r=.08$ ), and detached observer plus participant observer skill ( $r=.21$ ).

It was found that the student teacher did not predict more accurately for pupils of his own sex. Also, student teachers did not predict more accurately for pupils they assumed they knew well than for pupils they assumed they knew less well.

In conclusion, student teachers that are high in individual predictive empathy are better able to maintain harmonious interpersonal relations in the classroom. However, student teachers who can best predict the feelings of the group are not necessarily best able to maintain harmonious interpersonal relations in the classroom. It may be that individual predictive empathy and group participant observer skill are two separate abilities. Of these two abilities, individual predictive empathy, especially participant observer skill, seems most closely related to maintaining harmonious interpersonal relations in the classroom.

188 pages. \$2.45. Mic 56-2193

**A STUDY OF THE RELATIONSHIPS AMONG CLASSROOM CLIMATE, EMOTIONAL ADJUSTMENT, AND READING ACHIEVEMENT**

(Publication No. 16,612)

Abigail Ash Kasper, Ed.D.  
New York University, 1956

Chairman: Professor John W. Tietz

This study was undertaken to discover what data collected over a school year in a class of sixth grade children would reveal as to the relationships among good classroom climate, emotional adjustment, and reading achievement.

The importance of the problem is indicated by the number of emotional deviants and inefficient readers in the United States. The study is of children in the preadolescent era.

This era, of importance in an individual's life, is one that has been neglected in studies.

Several writers and investigators have used the words "atmosphere" or "climate" to denote the emotional tone of the classroom. The importance of climate and the place of the teacher in determining classroom climate has been noted by recent writers.

Withall devised a technique for measuring the social-emotional climate of the classroom.

Other investigators have written about the importance of the teacher-pupil relationship. The importance of consistent discipline has been recognized by several investigators in the field.

Many educators who have investigated the relationship between reading and the emotions have concluded that there is a close relationship between the two.

The present investigation of the relationships among classroom climate, emotional adjustment, and reading achievement is composed of the case studies of twenty-one sixth grade children whose I.Q.'s ranged from 70 to 99. Records for each child were kept for the period of one school year. The records included notes about the child's background, classroom behavior and scores on the measuring instruments used. The measuring instruments included reading tests, behavior rating schedules, sociograms and the "Draw-A-Person" test.

At the end of the year questionnaires were sent to the parents in an effort to ascertain both the child's and the parents' feelings about the year's work. A further check was made to determine whether there had been any unusual episodes in the child's life outside of school during the year which might account for any change which took place in the child during the year. In the absence of such episodes it was considered that changes were due to the classroom situation.

The classroom climate was assessed by using Withall's technique and also by the use of questionnaires which were sent to individuals who made repeated but unannounced visits to the classroom.

A study of the data revealed changes in the emotional adjustment, behavior problems, and classroom behavior of the group studied.

It was concluded that good classroom climate improved emotional adjustment, lessened the number and seriousness of behavior problems, and improved classroom behavior. In this group good classroom climate did not result in maximum reading achievement nor did improved emotional adjustment and maximum reading achievement accompany each other in every case.

Some less-warranted conclusions were that while there was no connection in this group between achievement in reading and social acceptability, there was a connection between general scholastic ability and social acceptability; that there was a connection between parents' ambitions for their children and the children's achievements; that there was a connection between good classroom climate and children's attitudes toward school and that good classroom climate resulted in a cooperative attitude on the part of parents.

It is recommended that more emphasis be placed, both in teacher-training institutions and with in-service teachers, on the importance of good classroom climate and that, likewise, the necessity for determining causes of behavior be stressed. It is also recommended that reading quotients and not reading scores be used as a measure of success in reading.

268 pages. \$3.35. Mic 56-2194

## THE PERSONAL-SOCIAL, EDUCATIONAL AND VOCATIONAL ADJUSTMENT OF BLINDED VETERANS OF WORLD WAR II

(Publication No. 16,594)

M. Charles Kaufman, Ph.D.  
New York University, 1956

The purpose of this study was to appraise the personal-social, educational and vocational adjustment of World War II blinded veterans in the New York area, who were entitled to vocational rehabilitation training under PL 16. Attention was directed to a comparison of those blinded veterans who were provided such training and those who were not.

Although the Vocational Rehabilitation and Education program of the Veterans Administration has been in existence since 1943, and has always been available to the approximately 1200 blinded veterans of World War II all over the United States and the 85 in this area, only 43 of the latter have taken advantage of their rights to date. Very little is known of the large segment of the total group who failed to avail itself of its entitlement to vocational rehabilitation. Who they are, their characteristics, their personal-social adjustment and their present educational and vocational attainments are relatively unknown to those concerned with their welfare.

The methods used to secure the results of this study consisted of the administration of two standardized personality adjustment inventories and the application of a series of nine rating scales by a team of two social worker raters, to the 37 trained and 33 untrained blinded veteran subjects. Each subject was individually interviewed, and all available Veterans Administration records were reviewed by the author of this study.

The population was equated on the basis of the degree of loss of sight, age, intelligence quotient, pre-service educational level, completion of a blind readjustment program and pre-service occupational level.

The results of the analysis of the scores on the adjustment inventories and rating scales indicate: that the blinded veterans exceeded the normative samples of the two adjustment inventories with respect to personal and social adjustment; the Untrained veterans were better emotionally adjusted than were the Trained on the Bell Adjustment Inventory. The personal interview and review of case records revealed that the Untrained veterans were generally better adjusted personally, socially, educationally and vocationally than the Trained veterans.

It was felt that of the two inventories, the Bauman was more useful with a blind population, although neither measure could do more than screen the extremes of the population for further study of more clinical character.

When certain apparently related variables of the three adjustment measures were intercorrelated, it was found that the meaning blindness held for the individual veteran seemed to depend principally on his own social experience since blindness, and that an adequate personal-social adjustment was intimately interwoven with his full acceptance in the family and the social community.

The findings of this research indicate that a larger sample using more judges and projective personality measures would probably provide more fruitful results.

Recommendations arising from the study are as follows. There should be more adequate use of preventive psychotherapy and social work to assist the blinded and their families in adjusting to handicap. An aspect of this

acceptance of handicap is how the disabled individual is received by his community. The best measure of this is the provision of an adequate number and variety of jobs at all skill levels.

Trade schools should be required by state law to open their doors to blind referrals from rehabilitation agencies. There should be supplementary state financial aid to pay for this liberalized admission policy. There should be an amendment to the State Fair Employment Practice Act requiring the employment of a fixed percentage of disabled in every industrial establishment with recourse to the State Fair Employment Practices Commission and the courts for enforcement.

192 pages. \$2.40. Mic 56-2195

#### CHARACTERISTICS AND DUTIES REQUIRED OF COOPERATIVE SECONDARY SCHOOL STUDENTS IN SELECTED RETAIL STORES

(Publication No. 16,616)

Carl Kraushar, Ed.D.  
New York University, 1956

The primary purpose of this investigation was to determine the skills, knowledges, and personal characteristics considered important by thirty-five employers in judging the success of 100 randomly-selected cooperative secondary school students employed in retail businesses representing department, variety, chain, and specialty store operations.

Differences in job-title designations among cooperating retail employers necessitated the development of an occupational classification suitable for use with cooperative retail students. Six job titles commonly held by retail students were described and coded: Cooperative Student, Cashier; Cooperative Student, Delivery Boy (Girl); Cooperative Student, Salesboy (girl); Cooperative Student, Shipping and Receiving; Cooperative Student, Stockboy (girl); and Cooperative Student, Wrapper.

Data were collected by the usual techniques such as interview, follow-up, and study and analysis of pertinent, published sources, and by means of two specially-constructed devices: A rating sheet and a job element checklist. Cooperative retail employers served as the judges in determining the merit of including any checklist element or rating sheet factor, and their collective responses served as the criterion by means of which the effectiveness of the retail student sample was measured.

An analysis of the rating sheet into four efficiency factors, eleven personality factors and one physical factor disclosed that the personality factors outweighed the efficiency factors by 2.51 times, and outweighed the one physical factor by 12.5 times. The degree of general acceptance of cooperative retail students by their employers, based on the latter's use of this rating sheet, was found to be 72 per cent.

The validity of the rating sheet was determined by correlation between the three-year high school average of the retail student sample and the ratings assigned to these 100 students by their employers. This correlation of +.45 appeared practically useless for differential prognosis although the t-test tended to support the contention that some degree of correlation existed between cooperative retail

job success factors and school achievement.

The checklist consisted of 265 duties and requirements discovered through observation, follow-up, interview, and questionnaire to be important to employers in evaluating the success of cooperative retail students; nineteen items were later eliminated by employers as being of negligible importance. This checklist was evaluated by submission to a jury of employers and by comparison with the major-content areas of thirteen currently-used secondary school retail textbooks. The remaining 246 elements were evaluated by the retail employers. An elaborate weighting plan, modified by Emerson's End Efficiency Per Cents Technique, a technique in which a relative value for each element was established, was used. These derived index numbers were used as the basis for assigning an order of importance number to each duty element with the intention of aiding members of syllabus committees in determining the degree of attention each item should receive in the cooperative retail program. These duty elements were arranged by reference to the twenty-two major content areas discovered previously. Each item was also analyzed with respect to the retail employers' opinions of its importance and then interpreted in light of common retail store practices.

The effectiveness of each of the five reporting secondary schools of the nine originally participating in this investigation, based solely on the responses of groups of ten students and their respective teacher-coordinator to the job element checklist, ranged from 35 per cent to 62 per cent; the most efficient retail school program was 1.77 as effective as the least efficient one.

A correlation coefficient of +.76, obtained in evaluating the reliability of paired, student responses was judged to be untenable when the t-test was applied.

376 pages. \$4.70. Mic 56-2196

#### THE RELATIONSHIP BETWEEN SOCIAL CLASS STATUS AND WHAT SIXTH GRADE CHILDREN SAY IS FUNNY IN SELECTED EXCERPTS FROM CHILDREN'S LITERATURE

(Publication No. 16,596)

Elliott D. Landau, Ph.D.  
New York University, 1955

The purpose of this investigation was to determine whether a relationship exists between the social class status of sixth grade pupils in the New York City area and what they say is funny in selected excerpts from children's literature.

Research in children's humor has been sparse compared with the large body of information relating to social class theory. Investigators have shown that in home and school life, leisure time activities, questions of morality, and in attitudes towards parents, teachers and peers, there are differences which may be attributed to the varying standards imposed by each group upon its members.

A total of one hundred and twenty (120) children in the sixth year of three New York City public elementary schools and one Westchester school were selected and placed into three social class groups based upon paternal occupation. Half of each group heard the examiner read

the twenty-six excerpts from popular children's books and the other half read them silently to themselves. A rating sheet partially devised by the children accompanied each reading and the children rated each excerpt on a 1-6 descending scale. They also indicated what part of the story was funny and then wrote in their own words why it was funny to them.

When the raw score for total reaction to the twenty-six excerpts was calculated for each child in each group, Analysis of Variance comparing two means at a time was calculated. This was done between all variables. Where the "F" derived reached either the .05 level of significance, thereby rejecting the null hypothesis, the same technique was used to determine upon which specific excerpts there were significant differences. Then the statements made by the children were analyzed for their content and placed into appropriate categories of humor. Finally, interviews with children were held to determine whether or not their conversational remarks could add to the knowledge obtained through the rating sheet.

These facts were discovered:

1. The most significant differences in reaction to the total material occurred between the children of the middle class and those of the other two groups. In each instance the total score of this group was far below either of the others. There was no difference between the overall reaction of the upper and the lowest group.
2. No significant differences were apparent between the sexes, the children of various I.Q. ranges, national backgrounds of their parents or religion.
3. The reasons given for finding things funny did not differ between the social class groups as much as they did within the groups.
4. Children react more positively to humorous material when they listen as a group as compared with reading it to themselves.
5. Sixth grade children enjoy incongruous happenings very much. Impossible and unusual things also delight them.
6. The interview technique in this type of study is only successful if the children are free to reply as they choose. Interviewing does enable the investigator to gather more details about the ways in which children reason their replies regarding funny things. The findings suggest that further study is needed to discover more about the reticence of the middle-class children to react to humorous material. Teachers of lower-class children may be assured that with little effort the road to happy classrooms through humor is possible. In listening to children speak freely we may learn to respect their reasoning abilities and thus see further into the maze of childhood and perhaps still more profoundly into ourselves.

250 pages. \$3.13. Mic 56-2197

#### AN EXPERIMENTAL STUDY OF THE INFLUENCE OF A COLLEGE READING PROGRAM ON ACADEMIC PERFORMANCE

(Publication No. 17,004)

Arthur Smith McDonald, Ph.D.  
Cornell University, 1956

Chairman: A. Gordon Nelson

This study compares the academic performance of those freshmen who completed the Cornell Reading Improvement Program in the fall semester of 1954 with the academic performance of a control group of freshmen. The process used to select this control group was designed to equate the groups in respect to motivation toward remedial work.

The experimental and control groups, which total more than 250 students, are stratified on the basis of type of scholastic aptitude test score available. The numbers of students in the experimental and control groups are proportional with respect to sex, and school or college of Cornell University.

The experimental and control groups are compared with respect to:

1. college grade-point averages for each of three semesters and cumulatively for the three-semester period.
2. tendency to make semester grade-point averages below 70.
3. tendency to remain enrolled in Cornell University.

The statistical technique of analysis of covariance is used to test the null hypothesis that there is no significant difference between the academic achievement of the groups as measured by college grade-point averages. The discriminant analysis technique is used to test the null hypotheses that students in the experimental and control groups do not differ in their tendency:

1. to make semester grade-point averages below 70.
2. to remain enrolled in Cornell University.

The results call for the rejection of the null hypotheses that there is no difference between the academic achievement of the groups as measured by college grade-point averages for the first semester, for the first two semesters cumulatively, and for the first three semesters cumulatively. The results also call for the rejection of the null hypothesis that there is no difference between the groups in tendency of students to make semester grade-point averages below 70 for the first and second semesters. The findings indicate that the null hypothesis that the groups do not differ in the tendency of their members to remain enrolled in Cornell should be rejected for all three semesters.

The general conclusion of the study is that the Cornell Reading Program favorably influenced the academic performance of students. Students who completed the Reading Program made significantly higher grade-point averages, had significantly fewer grade-point averages below 70, and showed a markedly greater tendency to remain enrolled in Cornell University than did students of the control group. Reading Program students also showed a significantly greater tendency to remain enrolled than did students who constituted the remainder of the freshman class after the experimental and control groups had been drawn from this class.

147 pages. \$1.95. Mic 56-2198

**WHAT HIGH SCHOOL FRESHMEN AND SENIORS  
WANT IN OCCUPATIONAL BOOKS**

(Publication No. 6282)

Sarah Splaver, Ph.D.  
New York University, 1953

Chairman: Associate Professor Milton Schwebel

**The Problem:**

The purpose of this investigation was to determine the attitudes of high school freshmen and high school seniors toward occupational books, the differences in attitudes between these two groups, and the differences that exist within these groups on the basis of reading levels, intelligence quotients, vocational decisions, and occupational experience.

**Basic Hypotheses:**

The basic hypotheses of this study were 1) that the attitudes of high school freshmen toward occupational books differ from the attitudes of high school seniors toward occupational books, 2) that the attitudes among high school freshmen toward occupational books differ when classified respectively on the basis of reading levels, intelligence quotients, vocational decisions, and occupational experience, and 3) that the attitudes among high school seniors toward occupational books differ when classified respectively on the basis of reading levels, intelligence quotients, vocational decision, and occupational experience.

**Design of the Study:**

There were 208 subjects in this investigation (117 freshmen and 91 seniors). These subjects were students in a freshman English and senior English class in four (4) New York City public high schools.

A questionnaire entitled "Questionnaire to Determine What High School Students Want in Occupational Books" was administered to these 208 students. Additionally, the paragraph sub-test of the Nelson-Denny Reading Test was administered to the subjects in this investigation. The intelligence quotients of these students were obtained from the record rooms of the respective high schools. These I.Q.s were based predominantly on the Pintner General Ability Test.

On the basis of the ratings attributed to the questionnaire items by the subjects of this study, it was possible to categorize these items via their mean scores as "very necessary", "necessary", and "unnecessary" for the two major groups (freshman and senior) and each of the sub-groups. The presence of statistically significant differences was determined by the chi-square formula.

**Results of the Study:**

1. The freshmen and the seniors indicated their approval of most of the standards set up by the National Vocational Guidance Association for the preparation and evaluation of occupational literature.

2. Differences in attitudes toward contents and characteristics of occupational books between the total freshmen and the total seniors were apparent for thirteen (13) of the eighty (80) questionnaire items. For each of these thirteen (13) items, the seniors attributed significantly greater value to the item than did the freshmen.

3. The facts that a) a significantly greater percentage

of the seniors than the freshmen had read occupational books, had completed an "Occupations" course, had been present at occupational discussions, and had had paid work experience, b) a significantly greater number of females was present among the seniors than among the freshmen, c) the seniors as a group had completed more social studies courses, and d) the seniors were older than the freshmen by an average of three years, may in part or in totality be the basis for these differences in attitude toward contents and characteristics of occupational books between the total freshmen and the total seniors.

4. While the two groups differ significantly in their attitudes toward thirteen (13) of the eighty (80) questionnaire items, statistical analysis based upon the theory of probability indicates that this number of differences is not sufficient to permit of the conclusion that these two groups are as different as two independent populations would be expected to be.

5. Although some statistically significant differences were found to exist between the freshman sub-groups and between the senior sub-groups, statistical analyses based upon the theory of probability indicate that for each factor --reading levels, intelligence quotients, vocational decision, occupational experience, and professional fathers--the number of statistically significant differences is not sufficient to permit of the conclusion that these freshman and senior sub-groups are as different as independent populations would be expected to be.

**Conclusions:**

Within the limitations of this study, whose subjects were drawn from public academic high schools in New York City, the following conclusions have been reached:

1. The over-all attitudes of high school freshmen toward occupational books do not differ significantly from the over-all attitudes of high school seniors toward occupational books and basic hypothesis #1 has not been confirmed.

2. The over-all attitudes among high school freshmen toward occupational books do not differ significantly when classified respectively on the basis of reading levels, intelligence quotients, vocational decision, occupational experience, and professional fathers and basic hypothesis #2 has not been confirmed.

3. The over-all attitudes among high school seniors toward occupational books do not differ significantly when classified respectively on the basis of reading levels, intelligence quotients, vocational decision, occupational experience, and professional fathers and basic hypothesis #3 has not been confirmed. 163 pages. \$2.04. Mic 56-2199

**EDUCATION, TEACHING TRAINING****A STUDY OF THE VALIDITY OF THE MINNESOTA TEACHER ATTITUDE INVENTORY AS AN INSTRUMENT TO AID IN THE SELECTION OF DIRECTING TEACHERS**

(Publication No. 17,022)

Albert Thompson Clarke, Ed.D.  
The Florida State University, 1956

Major Professor: Herman L. Frick

**Purpose**

The purpose of this study was to determine if a knowledge of the attitudes of a teacher, as measured by the Minnesota Teacher Attitude Inventory, would provide some indication of the probable success of the teacher as a directing teacher.

Three criteria were used to judge success as a directing teacher. These were: (1) desirable change in the attitudes of interns, as indicated by changes in MTAI scores of interns obtained immediately before and after the internship experience; (2) ratings interns gave to their internship experiences working with directing teachers; (3) ratings university coordinators gave to the performances of directing teachers.

**Procedure**

Data were derived from five sources: (1) scores of 149 directing teachers on the MTAI; (2) change in MTAI scores of 149 interns; (3) a rating scale developed for interns to rate their experiences; (4) a rating scale developed for coordinators to rate the performances of directing teachers; (5) a questionnaire developed to obtain data relative to the professional background of directing teachers.

**Major Findings**

(1) A positive and significant relationship was found between the attitudes of directing teachers and change in the attitudes of interns.

(2) A positive and significant relationship was found between the attitudes of directing teachers and ratings interns gave to their internship experiences.

(3) A positive and significant relationship was found between the attitudes of directing teachers and the ratings university coordinators gave to the performances of directing teachers.

(4) Negative or insignificant positive relationships were found between certain factors in the professional background of directing teachers and the three criteria of success as a directing teacher.

(5) A significant difference was found between the attitudes of directing teachers who had attended college for one year or more beyond a bachelors degree and those who indicated attendance for a period of less than one year.

**Conclusions and Recommendations**

Among the conclusions which seem to be implicit in the data are the following:

(1) The change in attitudes of interns was in the direc-

tion of the attitudes of the directing teachers in a majority of the cases.

(2) The evidence available in the study would not support the conclusion that a knowledge of the attitudes of a teacher would provide the basis for confidently predicting how successful the teacher would serve as a directing teacher.

(3) The evidence does justify the conclusion that a knowledge of the attitudes of an individual teacher can aid in determining the type of intern who should be assigned to the teacher for internship experience.

(4) A knowledge of the attitudes of a student teacher should be given consideration in selecting the directing teacher to whom the student teacher is to be assigned for internship experience.

(5) Since the Minnesota Teacher Attitude Inventory has been validated as an instrument to determine the attitudes of a teacher or prospective teacher toward children, school, etc., it is believed that this instrument can be used to aid in determining the directing teacher to whom a particular student should be assigned with respect to the attitudes of the directing teacher and the intern.

Recommendations which seem to be justified on the basis of the data are:

(1) The selection of directing teachers should be made with due consideration for the personality of the directing teacher and the intern.

(2) An intern should be assigned internship experience under a directing teacher who reveals more desirable attitudes than the intern.

(3) Directors of Internship should clarify with public school officials the qualifications desired of directing teachers when requests are made for new directing teachers and a knowledge of the attitudes of a teacher should be a qualifying factor to be considered in the selection of directing teachers.

254 pages. \$3.30. Mic 56-2200

**A STUDY OF THE REPORTED PRACTICES OF 538 TEMPLE UNIVERSITY GRADUATES AND STUDENTS IN THEIR TEACHING OF SOCIAL STUDIES IN THE ELEMENTARY SCHOOL**

(Publication No. 16,833)

Robert V. Duffey, Ed.D.  
Temple University, 1954

The main purposes of this study were: 1. to discover the prevailing practices reported by Temple University graduates and students currently in-service who had taken course work in the teaching of elementary school social studies at Temple University; 2. to compare these reported practices with practices recommended by Temple University faculty members and by recognized authorities in the teaching of social studies; and 3. to determine the effects upon the reported practices of such factors as sex of the teacher, grade taught, degree status, years of experience, and kind of certification held.

The study was based upon questionnaire findings from the three categories of respondents: 538 graduates and students, twelve faculty members, and eleven authorities.

A number of the modal practices reported by the graduates and students are summarized herewith. General

agreement or disagreement with the direction of the recommendations of the faculty members and the authorities are also indicated. "Both groups" refers to both the faculty and the authorities.

1. Fusion of history, geography, and other social sciences; and more often than not, inclusion also of science. Agreement with both groups.
2. Some fusion of other curricular areas with social studies. Agreement with both groups.
3. Allotment of about forty-five minutes a day to social studies; allotment of about forty-two minutes a week to current events. Disagreement with both groups.
4. Provision of junior news publications, all copies on the same reading level, the pupils and the teachers paying the cost. On the first point, agreement with both groups; on the other two points, disagreement with both.
5. Little utilization of workbooks. Disagreement with both groups, both being evenly divided in the matter.
6. Development of citizenship by helping pupils meet successfully on their level their own problems in home, school, and community. Agreement with both groups.
7. Use of stories of great Americans in order to build desirable intercultural relationships. Important disagreement with both groups, but also some agreement.
8. Attention to certain aspects of critical thinking. Agreement with both groups.
9. Evaluation of pupil learnings several times a year chiefly by means of teacher-made pencil and paper tests, pupils' evaluations, anecdotal records, informal recorded teacher judgments, and diaries and summaries. Concerning the methods used, important disagreement but also some agreement with both groups, concerning frequency of usage of the methods, disagreement with both groups.

Areas in which definite modal practice was not discovered were these:

1. Method of selecting current events topics. Agreement with faculty; important disagreement with authorities.
2. Chief use of junior news publications. Agreement with both groups.
3. Method of handling controversial issues. Important disagreement with both groups.

The variable factors most prominently associated with the reported practices--not necessarily the modal practices mentioned above--were the sex of the graduates and the students and the grade levels they taught. The most common combinations of factors were men and intermediate and upper grades, and women and primary grades.

334 pages. \$4.30. Mic 56-2201

## USE OF RESOURCES OF FEDERAL GOVERNMENT FOR TEACHER EDUCATION

(Publication No. 16,614)

Ruth Louise Kemp, Ed.D.  
New York University, 1956

Chairman: Professor Alonzo Myers

### The Purpose of the Study

This study was undertaken to ascertain the extent and nature of the use which teacher educators make of the various types of resources of the Federal Government in furthering the professional purposes they acknowledge. This study was devised to locate, systematize, and validate the types of services, activities, products, and experiences available from the Federal Government as curriculum materials for the education of teachers.

### The Method of the Study

To accomplish the purposes of the study the investigator has done the following:

1. Identified a number of objectives which educators of teachers acknowledge.
2. Developed a descriptive, annotated directory of the types of Federal Government resources which are potentially useful in achieving the acknowledged purposes of teacher education.
3. Determined by the questionnaire method how the educators of teachers, serving in their different capacities, use the types of Federal Government resources to achieve their acknowledged purposes.
4. Analyzed the teacher educators' judgments as to the value of the various types of resources in furthering their accepted purposes.
5. Prepared aids for locating the types of resources offered by the various Federal Government units.

### The Results of the Study

A survey of a number of colleges for teacher education showed that educators of teachers acknowledge six major controlling purposes related to

1. Desirable personal traits.
2. Knowledge and appreciation of the heritage of culture.
3. Knowledge and understanding of the physical and biological environment.
4. Understanding of contemporary society and culture, including education.
5. Understanding of human growth, development, and learning.
6. Understanding of and participation in the school program, including administration, curriculum, and teaching.

The survey of the Federal Government resulted in the selection of seventeen departments, agencies, and organizations of the Legislative and Executive Branches which

were analyzed for their activities, operations, services, products, and opportunities they offer for experiences which are potentially useful in furthering the six acknowledged purposes of teacher education. The seventeen departments, agencies, and organizations of Federal Government included eighty-eight units, each of which was found to offer a number of the seventeen different major types of resources which lend themselves to use as teacher education curriculum materials.

The analysis of the eighty-eight units of the seventeen departments, agencies, and organizations of Federal Government were set down in the form of a directory including two indexes designed to facilitate locating the resources by type and by source. A chart showing the location of the various types of resources by Government unit and the availability of guide materials for individual units was devised.

The investigation of the use of the types of Federal Government resources revealed that teacher educators, working in a variety of capacities and positions, use the resource types in college services, activities, and courses. It showed that teacher educators use the resource types to further all their professional purposes. However, the study revealed that the uses of the types of resources concerned are not common among educators of teachers. Further, it showed that teacher educators, in general, are not aware of the existence and availability from the Federal Government of potential curriculum materials in the forms of the resource types considered in this study.

The teacher educators rated the resource types as of high value in aiding their professional purposes. They judged only a few of the extensively used resource types as of medium value.

#### Summary and Recommendations

The directory comprises a guide to a source of curriculum materials. The investigation of the use of the resource types is exploratory, only. It is recommended that the latter aspect of the study be repeated at a reasonable interval after the publication of the directory. It is recommended that the directory be revised periodically.

205 pages. \$2.56. Mic 56-2202

#### OPINIONS OF PHYSICIANS, LAWYERS, AND COLLEGE PROFESSORS IN OKLAHOMA CONCERNING RECENT CRITICAL JUDGMENTS OF PUBLIC EDUCATION

(Publication No. 16,761)

Edwin LeRoy Lyle, Ed.D.  
The University of Oklahoma, 1956

Supervisor: Dr. Henry D. Rinsland

Previous inquiries concerning public opinion toward public education have tended to show that the most critical groups are those with the greatest amount of formal education. This study attempts to analyze more closely the extent to which four specific professional groups, viz., physicians, lawyers, and professors of liberal arts and of education agree or disagree with a somewhat representa-

tive list of critical judgments of public education. Such critical judgments have appeared in popular and professional literature from 1940 to 1955.

An opinionnaire was constructed containing seventy-seven specific criticisms which were classified into ten categories of criticism. The test-retest coefficient of reliability of the opinionnaire was found to be .95 when administered to college students. All respondents to the opinionnaire resided within the state of Oklahoma. Physicians were members of the American Medical Association, lawyers were members of the American Bar Association, and college professors were employed by colleges and universities accredited by the North-Central Association of Colleges and Secondary Schools.

A fairly representative random sample of each of these groups was selected to whom opinionnaires were mailed. Nine hundred and forty-two opinionnaires were mailed in all. Six hundred and thirty-three, or 67% of the total number mailed, were used in the analysis of data.

The following findings are based on the responses of these four professional groups:

1. The four professional groups are much more favorable toward public education than some of the critics would have us believe.
2. Liberal arts professors are the most critical of the four groups. They express significantly unfavorable opinions toward teacher training practices, discipline, and the teaching of the "fundamentals."

3. The two groups among the four which express the greatest differences in opinions toward public education are education professors and liberal arts professors. Fewest differences are found between physicians and lawyers.

4. Large percentages of physicians, lawyers, and liberal arts professors indicate they do not know concerning the advisability and worth of several newer school practices such as longer class periods where problems relating to pupil interests are studied, and the practice of combining two or more subjects for instructional purposes.

5. Physicians and lawyers are more concerned than are the professors that the schools are failing to teach pupils how to use their leisure time wisely.

6. Both physicians and lawyers express concern with socialistic trends in the schools.

7. All groups are in favor of schools of education in colleges and universities since the essentials for teachers cannot be taught in other departments.

In conclusion, a defense is made of public education considering especially the charges made by liberal arts professors. This defense compares the schools of today with those of an earlier day as to characteristics of the school population, qualifications of teachers, and the demands of society upon the schools.

122 pages. \$1.53. Mic 56-2203

**BUSINESS EDUCATION IN THE PUBLIC  
SECONDARY SCHOOLS IN THE STATE OF  
MICHIGAN (EXCLUDING CITY OF DETROIT)**

(Publication No. 16,939)

Lyle Maxwell, Ed.D.  
University of Colorado, 1955

Supervisor: Professor Hubert H. Mills

This study was designed to discover (1) the existing school policies and opinions of business teachers on selected phases of organization and administration, pupil guidance, placement, and follow-up, the business curriculum and classroom methods, and the standards of achievement of business education. (2) This study is also concerned with the qualifications of the teachers who are conducting the business education program in the public high schools in the state of Michigan. (3) A third purpose of the study is to evaluate the findings in light of established evaluative criteria.

Investigation procedures included an examination of other state studies and literature relating to problems in this study. Questionnaires were sent to the public secondary business teachers seeking information and opinions on their training (educational, professional, and business), curriculum and methods, standards of achievement in the skill subjects, equipment, supervision, extra-curricular and community activities.

Comparison of the findings of this study to related studies reveals that many of the existing problems today in business education have existed at least twenty years or more. Perhaps the one outstanding recommendation made by all the investigators is that the business education curriculum should be designed to meet the needs of all students. Such a curriculum must contain vocational courses geared to the varying abilities of all students as well as general business courses that will contribute to the economic literacy of all students.

The findings of this study reveal that one third of the business teachers have their Master's degree. Nearly 75 per cent have specialized in more than one area of business education. Seventy-three per cent of the business teachers have had an especially-designed business education methods course. About fifty per cent have had advanced work in the past three years, only forty-two per cent are planning to do advanced study. Sixty-three per cent hold a permanent teaching certificate. Eighty-five per cent of the business teachers have had some type of work experience.

Eighty-four per cent of the schools open business education subjects to all students in the school. Slightly over sixteen per cent of the schools offer any type of business principles on the junior or senior level and only thirty per cent of the schools offer consumer education. All schools reporting offer typewriting. Only 111 schools reported having any type of business club.

Since there is an absence of teaching equipment and community employment surveys, one might surmise that the curriculum is not necessarily built around the needs of the students or the community. Community surveys have been done by schools with cooperative training programs or by graduate students desiring material for a thesis.

The business teacher is seemingly lacking in professional spirit. Evidence reveals that many do not participate in professional organizations, do little professional

reading, and almost no publishing. They are lax in participating in community activities. Business teachers also do not avail themselves of all the resources which enhance classroom teaching.

There appears to be a lack of constructive planning and budgeting by school administrators since only 58 per cent of the business teachers felt that their classrooms were suitable for the subject taught by them and slightly over half felt the furniture was adequate. Only fifty per cent of the schools have a trade-in policy. Administrators were also criticized by business teachers for their poor leadership in the matters of supervision, in-service education, pupil selection for vocational courses, placement, and follow-up.

Teacher-education institutions should evaluate their business education curricula to find if they are meeting the needs of the prospective teachers. The curriculum should include a balance between general education, vocational education, and professional education courses. Teacher-education institutions should exercise more leadership in in-service teacher-education work throughout the state.

It is highly recommended that administrators and business teachers acquaint themselves with "The Principles of Business Education," Eighth Yearbook, published by the National Business Teachers Association, and other evaluative criteria as a means of reviewing their programs of business education in their own schools.

445 pages. \$5.70. Mic 56-2204

**FACTORS INFLUENCING THE WORK OF  
TEACHERS IN FAIRFAX COUNTY, VIRGINIA**

(Publication No. 17,397)

Ida Bell Morford, Ph.D.  
The Ohio State University, 1956

**STATEMENT OF THE PROBLEM**

The problem of the study was to identify the most important factors that influence the work of teachers in the public schools of Fairfax County, Virginia.

**METHOD OF PROCEDURE**

A local committee, consisting of representatives from the administrative, supervisory, and instructional staffs of the county school system, was authorized in May, 1954, to provide the writer with guidance in making the study.

In June, 1954, a preliminary questionnaire was sent to all teachers in the county, requesting them to list the most important factors that influenced them in their teaching.

Statements from 498 teachers (62 per cent) were tabulated. The factors most frequently mentioned were made the basis of a final questionnaire designed to determine the extent to which these factors existed in the county and the degree of effect each had upon teaching, and to obtain recommendations for change.

The questionnaires were distributed to the 664 elementary-school and 282 secondary-school teachers in the county in May, 1955.

**RESULTS**

Eighty-six per cent of the teachers returned the questionnaires with their judgments and recommendations con-

cerning human relations, administrative policy, instructional materials, physical conditions, special services, and teacher-load in the county school system.

#### CONCLUSIONS

The most important factors which aid teachers at both elementary and secondary levels in Fairfax County are helpful, coöperative, understanding principals and supervisors; the freedom allowed teachers to plan and teach as they think best; and good human relations among teachers within a school.

Elementary-school teachers are hindered most in their work by an excessive amount of clerical work and a lack of time away from their pupils during the day.

Secondary-school teachers believe that they are hindered most by interruptions during their teaching and by the removal of pupils from class for other school activities.

More than half of the recommendations from five hundred teachers involved hiring additional personnel to teach art, music, and physical education in the elementary classrooms; lightening the class load of elementary-school and secondary-school teachers in order to provide a free period during the day for each teacher to devote to school work other than direct teaching; taking over some of the clerical work now being done by the teachers; and reducing the pupil load of some of the teachers in the elementary schools.

127 pages. \$1.70. Mic 56-2205

#### A CRITICAL STUDY OF BUSINESS EDUCATION IN THE PUBLIC SECONDARY SCHOOLS OF OHIO

(Publication No. 16,617)

Jack Ramsey Neill, Ed.D.  
New York University, 1956

#### The Problem

The purpose of this document is to make a critical study of business education in the public secondary schools of Ohio for the purpose of making recommendations for its improvement.

The solution of this problem seemed to involve the following questions concerning business education in the public secondary schools of Ohio.

1. What are the basic aims and purposes of business education as indicated by school administrators, business teachers, business students, and business men?
2. What is the nature of the business curriculum?
3. What instructional materials and activities are utilized by business teachers in Ohio?
4. What are the characteristics of the student personnel?
5. What is the professional status of the business teacher?
6. What is the professional status of the school administrators responsible for supervision of the business education program?
7. What is the nature of the physical plant and equipment provided for administering the business education program?
8. On the basis of the facts that answer the foregoing seven questions, what recommendations can be made for the

advancement of business education in the public secondary schools of Ohio?

#### Procedure in Solving the Problem

Three procedures were used to collect the data for the study. A summary of the statistical data applicable to the solution of the specific problems of the study was made from the 1038 Reports of the High School Principals to the State Director of Education for the school year 1951-1952.

In addition to the statistical summary of all the high schools in Ohio which come within the scope of the study, the business programs of 30 schools were evaluated in detail. The data pertaining to the 30 schools were collected by the use of check lists and personal interviews.

#### Recommendations

1. A statement of philosophy should be developed cooperatively for each school. This might serve as the basis for the examination and evaluation of the school program.
2. School officials and teachers should be encouraged and urged to obtain and use reliable data, as a basis for making decisions concerning desirable changes in the business education program and for determining the effectiveness of the program.
3. School administrators should accept the democratic principle that all who are affected by a policy should have the opportunity to participate in the shaping of the policy.
4. The school, through its philosophy, organization, and methods of operation should be exemplary of the democratic way of life.
5. Genuine efforts should be made to integrate the many heterogeneous business courses in the area of basic business into a core of common learnings made available to all students.
6. Serious study should be given to the methods used by those schools who are operating successfully coordinated work-experience programs as part of the regular school curriculum.
7. Teacher training institutions should develop, as a part of the teacher training program, those experiences that will build a "community mindedness" in business teachers so that they will associate active participation in professional, civic, and community activities as an integral part of being a good teacher as well as a good citizen.
8. University and teacher training centers should endeavor to exert stronger leadership within their respective service areas by working more closely with local teacher groups in the study of their curricular problems.
9. The State Department of Education of Ohio should assume greater responsibility for the improvement of business education in the State by making available periodic reports concerning the successful practices and methods of teachers within the State, and by furnishing qualified consultant service to the public schools.
9. The Ohio Business Teachers Association should exert stronger leadership in the State by coordinating the ef-

- forts of the various discussion and study groups in the sectional meetings of the Ohio Education Association and publicizing the results or outcomes of such meetings.
10. Continued study should be made by the Ohio Business Teachers Association to determine additional ways and means of involving a greater number of business teachers in the activities of the Association.
  11. School administrators, supervisors and/or curriculum directors should exert greater effort in working with teachers to develop ways and means of utilizing the rich teaching resources available in most communities.
  12. School officials with the help of local business associations should make available adequate classroom furniture and the types of office machines needed to train business students for initial employment in office or distributive occupations common to the employment area served by the school.

295 pages. \$3.69. Mic 56-2206

**A STUDY OF THE NATURE AND USE OF  
THE HANDBOOK AS RELATED TO SELECTED  
ASPECTS OF THE ORIENTATION PROGRAM  
FOR STUDENT TEACHERS**

(Publication No. 16,941)

Robert Allen Oesterle, Ed.D.  
University of Colorado, 1955

Supervisor: Professor H. H. Mills

The purpose of this study was to investigate the nature and use of locally developed handbooks for student teachers. Particular attention was directed toward the ascertainment of handbook content, the responsibilities of staff members as related to the supplementation of information contained in the handbook, and the major functions and values of the handbook. Data were obtained from a survey of related studies, from questionnaires forwarded to selected authorities in teacher education and directors of student teaching in colleges and universities in the United States, and from analysis of locally developed handbooks. The paucity of literature concerning handbook content and the current interest in handbook implementation indicated the value of a study of this nature.

Ninety per cent of the forty authorities who were invited to serve as a panel of experts replied; 71 per cent of the directors of student teaching in 428 colleges and universities selected for participation by random sampling techniques responded; and sixty-six handbooks for student teachers were received and analyzed during the conduct of the investigation.

As part of the questionnaire survey, respondents were requested to express their opinions relative to the value of including eighty-eight topics of information in a handbook. Information concerning the relationship of the student teacher with the principal, supervisor, supervising teacher, and other staff members was given considerable support as a valuable component of the handbook. Some of the other information that should be included concerned conferences, evaluation of student teaching, lesson plans, proper attire

for student teaching, personal hygiene of the student teacher, purposes of student teaching, authority of the student teacher, and his conduct in the community. Comparison of the opinions of authorities and representatives of the colleges was accomplished by application of Spearman's rank-difference correlation method, which yielded a *rho* of 0.84. Analysis of actual handbook content indicated that the majority of these instruments contained information pertinent to the topics considered important by the respondents.

Locally developed handbooks were being used in seventy-five of the 291 institutions for which information was available. Forty-six per cent of the publicly supported, 11 per cent of the denominational, and 17 per cent of the privately endowed colleges reported that a handbook was being used. Eight per cent of the respondents stated that handbooks were being developed, indicating a trend in the direction of more general utilization of these instruments. Eighty-three per cent of the handbooks inspected were compiled cooperatively by the director of student teaching, supervisors, supervising teachers, student teachers, and other personnel affiliated with the student teaching program. Most handbooks were 8 1/2 x 11 inches and were reproduced by the mimeograph process. The handbooks contained from five to 157 pages, the median number being sixteen.

The handbook should serve as a point of departure during individual and group conferences, as well as being used as a readily available source of information. It should strengthen and enrich rather than lessen the need for personal conferences. Eighty-seven per cent of the college representatives believed that a locally developed handbook is a worthwhile component of the orientation program for student teachers, and 92 per cent of the authorities gave unqualified support to the need for handbook implementation.

Concerning the values of a locally developed handbook, respondents reported that these instruments depict accurately local problems of student teaching, promote necessary uniformity, provide valuable orientation material, stimulate in-service education, serve as a guide for new staff members, provide a measure of security for all concerned with the program of student teaching, and enrich the program of supervision.

429 pages. \$5.50. Mic 56-2207

**A COMPARISON OF TWO CURRICULUMS FOR THE  
PREPARATION OF TEACHERS OF MATHEMATICS  
IN SECONDARY SCHOOLS AND OF THE STUDENTS.**

TRAINED UNDER EACH

(Publication No. 16,990)

Edmund Cole Osborne, Ed.D.  
Boston University School of Education, 1956

A search was made of all the literature of the past quarter century concerning the training of teachers of secondary school mathematics. This was done to discover criteria to judge the adequacy of such curriculums and to apply them to the two curriculums which the writer has administered at the State Teachers College at Worcester, Massachusetts. The literature read included: Reports of National Committees; Periodical Articles, Bulletins, and Monographs; and Research Studies. The criteria thus

established indicated that such an adequate curriculum would provide:

1. Broad training in mathematics far beyond any course which the prospective teacher will ever teach.
2. A course of study built around a 'core curriculum' consisting of college algebra, solid geometry, trigonometry, analytical geometry, and differential and integral calculus.
3. A specific course in methods of teaching secondary school mathematics.
4. A course in the history and philosophy of mathematics.
5. Practice teaching of mathematics in a junior or senior high school.
6. Courses in related fields, in applied mathematics, in non-Euclidean geometry, and in the use of multisensory aids for the teaching of mathematics.
7. Observation of the work of master teachers of mathematics.
8. Thirty semester hours of content courses in mathematics.

Two curriculums for the training of teachers of secondary school mathematics which the writer has offered to students at the State Teachers College in Worcester, Massachusetts were compared in terms of these criteria. It was found that the curriculum offered to the classes of 1928 through 1940 was the better of the two but not adequate in terms of the criteria. This curriculum did provide 24 semester hours of content work in mathematics; a course in methods of teaching secondary school mathematics; a course in the history and philosophy of mathematics. It fell short of the criteria in that it offered too few courses in content mathematics; the students trained under it did not do practice teaching in junior or senior high schools; they had little or no work in related fields, no work in non-Euclidean geometry, and no instructions in the use of multisensory aids. The second curriculum offered to the class of 1941 and all succeeding classes was definitely inferior to the first and met only the sixth of the criteria.

The students trained under these two curriculums were compared in terms of the amount and quality of their high school preparation in mathematics and in science, their personality ratings, and the amount and quality of their college work in mathematics and science. The students trained under the first curriculum were compared with those trained under the second, and various sub-groups within each of these two main groups were compared with each other and with the corresponding group trained under the other curriculum.

It was found that the students who were trained under the second curriculum were on the whole superior to those trained under the first, in terms of the characteristics measured, and that those who as entering freshmen chose mathematics as their major and persisted in this choice were superior to those who made the same choice but who did not persist.

The study also included a follow-up of the 226 students who started as mathematics majors and who were graduated.

It was found that 46 mathematics majors and 16 non-majors had had teaching experience in the field of secondary mathematics. Replies received from 50 of these

graduates indicated that most of them had taught for only one or two years and that practically all of this teaching had been done in grades seven through nine.

325 pages. \$4.20. Mic 56-2208

#### THE STATUS OF BUSINESS EDUCATION METHODS COURSES IN SELECTED COLLEGES AND UNIVERSITIES IN THE UNITED STATES - 1955

(Publication No. 16,945)

Charlotte Elizabeth Tuthill, Ed.D.  
University of Colorado, 1955

Supervisor: Professor H. H. Mills

This study was primarily designed to: (1) ascertain the status of undergraduate and graduate business education methods courses as currently offered in institutions of higher learning throughout the United States, (2) obtain opinions from leaders in the field of business education concerning the most desirable business education methods courses, and (3) make recommendations for improvement of business education methods courses that seem justifiable on the basis of suggestions received.

In the absence of investigations designed to ascertain current offerings, course content, teaching procedures, equipment and facilities used in business education methods courses, a study of this nature seemed justifiable. A comparison of jurors' opinions concerning desirable business education methods courses with the status made information available for orienting business education methods teachers who will teach the courses for the first time and provided a source of information for evaluating individual business education methods courses.

Investigation procedures included an examination of literature relating to business education methods courses, a questionnaire survey of accredited colleges and universities offering business teacher education programs, and an opinionnaire to obtain opinions of leaders in the field of business education concerning the most desirable business education methods courses.

Interest in this study was expressed by responses from twenty-three jurors and sixty-five per cent of the institutions invited to participate in the study.

Approximately ninety per cent of the institutions offering business teacher education programs offered undergraduate business education methods courses. Only forty per cent of the institutions included in this study provided graduate business teacher education programs and graduate business education methods courses.

Approximately one-half of the schools included in this study offered a single undergraduate business education methods course in teaching all business subjects. Other undergraduate courses and more than three-fourths of the graduate business education methods courses concerned the teaching of groups of related business subjects or a single business subject.

A representative course was offered at the undergraduate level and at the graduate level at least once each academic school year. Additional graduate methods courses in business education were offered in summer sessions.

Instructors of business education methods courses were

required to have minimum preparation including a master's degree, teaching experience and business experience. Additional educational requirements were made of the teacher of graduate business education methods courses.

Objectives stressed for methods courses in teaching business subjects varied widely. Those most frequently stressed for both graduate and undergraduate methods courses concerned the development of skill in using teaching techniques, materials and methods.

In general, the status as reported by business education methods instructors in institutions cooperating in this study compared favorably with jurors' opinions concerning the desirable business education methods courses for undergraduate and graduate students. The greatest point of disagreement between jurors' opinions and the status report concerned student specialization at the undergraduate level. Jurors favored some type of specialization for undergraduate students.

A careful study of the jurors' opinions, the status report and literature pertinent to the problem was the basis for recommendations for improvement of business education methods courses. It was recommended that separate courses, taught at different levels, be provided for undergraduate and graduate students.

Facilities and teaching personnel available, the undergraduate business education methods courses should be extended to at least two courses with six semester hours credit or its equivalent. This would facilitate student specialization in two broad areas of business subjects.

505 pages. \$6.45. Mic 56-2209

#### EDUCATION, THEORY AND PRACTICE

##### A STUDY OF COMPETITION WITH SPECIAL REFERENCE TO ITS ROLE IN PUBLIC EDUCATION

(Publication No. 17,380)

Erven Elmer Brundage, Ph.D.  
The Ohio State University, 1956

In the study, competition was defined as the behavior of a person as he acts alone, or as a member of a group, attempting to place himself in a position which is superior to that of certain other persons.

The problem. It was the purpose of the study to:

1. Analyze and define the concept of competition
2. Investigate the writings of educators and determine their attitude toward competition
3. Compare, by means of a questionnaire, the attitudes of educators, business executives, and wage earners concerning three aspects of competition
4. Propose a role for competition in the public schools

Procedure.

1. Competition was analyzed in terms of a) its operation in the present-day culture, b) the question of whether or not man is inherently competitive, and c) the effectiveness of competition as a means of motivation.

2. Through an investigation of the literature, the attitudes of influential educators were determined.

3. A questionnaire was constructed comprised of thirty items which were responded to on a five-point scale.

##### Conclusions.

1. Since there are both competitive and non-competitive elements in our culture, it cannot be clearly labeled one or the other, though economically it remains basically competitive.

2. Competition produces a greater quantity of work, and the work is more efficient than when competition is not present. Competition raises the blood pressure and increases the pulse rate. It releases latent energy and mobilizes the individual for action. It is therefore effective in motivation.

3. The basic goal of all individuals is a sense of increased worth in the eyes of their fellow men. Competition, at present, is necessarily involved in achieving this goal.

4. Human beings are born with potentialities for both coöperative and competitive behavior, but these do not occur in equal amounts in all individuals. There is evidence that some seek and respond well to competition while others respond better to coöperation.

5. The writings of a limited number of influential educators revealed that they emphasize the values of coöperative behavior as opposed to competitive behavior.

6. The attitudes of business executives strongly favor competition and differ significantly (.01 level) from those of educators and wage earners.

7. The attitudes of educators in six different fields toward competition did not differ significantly.

8. Educators believed that man is natively somewhat competitive, that competition is not a good means of motivation, and that the present-day culture is not competitive.

9. To a significant degree, men favored competition more than did women, older people more than younger people, and parents more than non-parents.

##### Recommendations.

1. Competitive marks and contests are worth while in the classroom when used to inform, not to intimidate. They are recommended, since competition was shown to be an effective means of motivation.

2. Teachers should show students how to compete as well as coöperate, since competition is an inevitable part of social living.

3. The unresolved struggle between individualism and socialism is, in a sense, a struggle between competition and coöperation, and should be dealt with openly through classroom experiences.

4. The concept of competition should be changed from one of "each against all" to one of exploration whereby individuals can determine their most productive place in society.

5. Educators should increase the amount of status available in the classrooms, thereby reducing the intensity of the struggle for status.

6. Individual predisposition to competitiveness of coöperativeness should be recognized in the classroom.

7. Competition should not be forced among students whose abilities differ markedly.

8. Since it is recognized that individuals compete for status in society, students should be shown that coöoperative behavior is a rewarding method for achieving it.

262 pages. \$3.40. Mic 56-2210

## NONPARAMETRIC CONFIDENCE LIMITS

OF THE INTERQUARTILE RANGE

(Publication No. 17,219)

Richard C. Clelland, Ph.D.  
University of Pennsylvania, 1956

Supervisor: Dr. Merle W. Tate

The methods discussed in this thesis are based upon the joint probability distribution of the twenty-fifth and seventy-fifth percentiles in any continuous population. From such a population select a random sample of  $N$  items dividing the population into  $N + 1$  intervals  $I$ . Let  $A_i$  be the statement that the population's twenty-fifth percentile is in  $I_i$ . Let  $B_j$  be the statement that the population's seventy-fifth percentile is in  $I_j$ . If  $p_N(A_iB_j)$  represents the probability that both  $A_i$  and  $B_j$  are true for a sample of size  $N$ , then it is shown by induction that

$$p_N(A_iB_j) = \frac{N!}{2^{2N}} \frac{2^{j-i}}{(N-j)! i! (j-i)!}.$$

This probability distribution is then used to obtain nonparametric confidence limits for the length of the interquartile range. Numerical arrays representing the distribution are computed for samples of size 1-50. Upper and lower confidence limits for the length of the interquartile range are then calculated by systematically subtracting certain elements from these arrays. These results are summarized in tabular form for three levels of significance.

This table may be used in a simple test of the hypothesis that a sample is drawn from a population whose interquartile range has length equal to some constant  $E$ . One merely orders the sample, calculates the confidence limits from the table, and accepts or rejects the hypothesis depending upon whether  $E$  lies within or without the interval.

When least-squares lines are plotted from the data for  $N \leq 50$ , it is found that reasonable fits are obtained at the three significance levels under consideration for samples of size less than 100. Hence graphical methods can be used to obtain approximate one-sample confidence limits in samples of sizes ranging from 50 to 100.

Similar methods are also applied to two independent samples. The appropriate probability distributions are products of the previously tabulated one-sample arrays. Joint confidence limits are set giving an indication of the lengths of the interquartile ranges in the two populations. However, it is felt that this work is exploratory in nature and that the two-sample results do not discriminate sufficiently to warrant their use in practical situations. On the other hand, it is thought that the one-sample results will prove to be useful in educational research.

78 pages. \$1.50. Mic 56-2211

THE DIFFERENCES IN SOCIAL BELIEFS HELD BY  
SELECTED EDUCATION AND NON-EDUCATION  
SENIORS AT THE UNIVERSITY OF MICHIGAN,  
FALL, 1952

(Publication No. 17,429)

Carl Murray Einhorn, Ph.D.  
University of Michigan, 1956

This study is an attempt to discover the differences in social beliefs held by selected Education and non-Education seniors at the University of Michigan in the February class of 1953. The public criticism of Education, so prevalent during the present time, seems to have its source in the manner in which the social beliefs of the lay leaders differ from those of the professional educators. This study attempts to ascertain the existence of differences in social beliefs between potential lay leaders of society, seniors about to graduate in curricula not in the field of Education, and potential educators, seniors about to graduate in the field of Education.

A sample of 56 seniors of the class of February, 1953, in the School of Education were matched with a sample of 56 seniors in other curricula at the University of Michigan on the basis of religion, sex, occupational background of the working parent, honor-point average, and primary areas of teacher certification or primary areas of academic concentration. Both groups were given the Inventory of Social Understanding issued by Cooperative Study in General Education, consisting of 150 questions of the cliche type, divisible into nine basic categories. Each question was answered in one of three ways: agree, uncertain, or disagree. The statistical techniques: analysis of variance, t-scores, and coefficients of correlation, were then applied to determine whether differences existed and, if so, what the level of significance might be.

In seven of the nine categories of the Inventory, statistically demonstrable differences were found between males and females at the .05 level of significance or above. Statistically demonstrable differences in the mean scores of the seniors were found, when they were classified according to religious groups, age level, and occupation of the working parent, but the findings were not sufficiently conclusive to support a hypothesis that the above groupings are more influential determinants of social beliefs than is field of study. A positive correlation between honor-point average and social beliefs was also found, but was not high enough to suggest a good positive relationship.

Statistically demonstrable differences among the mean scores of the Education seniors, classified according to the primary area of teacher certification; and of the non-Education seniors, classified according to primary area of academic concentration, were not sufficiently significant to support the hypothesis that area of study is a greater determinant of social beliefs than is field of study. Differences in the mean scores of the Education seniors, classified according to each area of teacher certification, and the mean scores of the non-Education seniors, classified according to each area of academic concentration, were found but were not sufficiently consistent to suggest that the force of specific orientations within an area of academic concentration or teacher certification is sufficient to act as a primary determinant of social beliefs. Differences between the mean scores of the Education seniors and the mean scores of the non-Education seniors were found with

a sufficiently high degree of consistency (at a level of significance of .02 or above) to support the hypothesis that measurable and significant differences do exist between the social beliefs held by Education and non-Education seniors, included in this study, and that field of study is a primary determinant of social beliefs.

The results suggest that a similar study should be made at a large sampling of the schools and universities throughout the country to determine the extent of the differences in social beliefs between Education and non-Education students and, if possible, the underlying causes that produce such differences. 128 pages. \$1.70. Mic 56-2212

**A STUDY OF THE PROGRESS MADE  
BY TWENTY-FOUR RETARDED READERS  
IN AN IMPROVEMENT PROGRAM**

(Publication No. 16,757)

Lillian A. French, Ed.D.  
The University of Oklahoma, 1956

Supervisors: Dr. Arthur W. Heilman and  
Dr. Edwin V. Mech

Many and varied attempts have been made to meet the needs of the retarded reader in the public schools. However, most of the studies reported have dealt with remediation of individual pupils rather than groups; or with the remedial problem at other levels than the elementary school.

This study was conducted to assess the effects of a one-year program of remediation in the area of reading. The 24 subjects in this investigation were selected from grades 5, 6, 7, and 8 of the public elementary schools in Maricopa, California, on the basis of intelligence and reading retardation. These pupils met in special remedial reading groups of 5 or less pupils. The study consisted of 5 groups who met 4 days a week in 30 minute periods. Individual, as well as group instruction was given.

Concern was focused upon the problem of whether each individual pupil exhibited gains or improvement in each of the following areas: (1) reading performance on standardized tests, (2) oral reading proficiency, (3) types of errors made, (4) sight vocabulary, (5) phonetic inventory, and (6) spelling. Each pupil was compared with his performance on the foregoing variables before entering the improvement program with his respective performance on the measures after participating in the program.

One unique feature of the improvement program was the use of the typewriter as a motivational device and as an aid in teaching certain facets of reading. However, the typewriter was only one of a compound set of techniques used in the remedial teaching.

The improvement program was divided into three two-month periods: the typing period, non-typing period, and optional period. In addition to the pre-tests given in October and the post-tests given in May, tests were also given in January and March, in order to observe any changes made in pupil progress; and in order to observe pupil reactions when the typewriter was or was not present. No attempt was made to measure skill in typing.

Summary of the findings and conclusions:

Significant gains were found in silent reading, oral reading, and in spelling. The mean gain in silent reading was 1.13, and in oral reading was 1.52 years. In the main, the gains made in sight words, and the phonetic inventory test, were found to be significant. The greatest gains in reading were made during the optional period and the greatest gains in spelling were made during the non-typing period.

The typewriter appeared to be an effective tool for transmitting certain aspects of the remedial teaching to the pupils; and to act as a motivation to them, although, as the program progressed, it seemed to lose its initial attraction and the reading gained in importance to the pupils. Other techniques, such as simplified phonetic and spelling rules, considerable oral reading, and certain drills were all an effective part of the remediation program.

110 pages. \$1.38. Mic 56-2213

**THE COMPARATIVE EFFECT OF COLOR AND  
BLACK AND WHITE GUIDANCE FILMS EMPLOYED  
WITH AND WITHOUT "ANTICIPATORY" REMARKS  
UPON ACQUISITION AND RETENTION OF  
FACTUAL INFORMATION**

(Publication No. 16,972)

Billie J. Fullerton, Ed.D.  
The University of Oklahoma, 1956

Supervisor: Dr. Gail Shannon

Previous investigations have repeatedly shown that, properly introduced, black and white films facilitate learning. However, experimentation concerning the effect of color film and the use of "anticipatory" remarks has indicated that further investigation is required in these areas. The present study was designed to obtain additional empirical information concerning the comparative effect of color and black and white films when employed with, and without, "anticipatory" remarks.

The purposes of the study were: (1) To determine the effect of guidance instruction from color and black and white film employed both with, and without, "anticipatory" remarks; and (2) to compare these four experimental treatments as they relate to the acquisition and retention of factual information.

The 551 participating subjects were eleventh and twelfth grade students from Clinton, Elk City, Hydro, and Weatherford, Oklahoma. The students enrolled in the schools where films were presented were randomly assigned to their groups: Group A received instruction from color films; group B was read "anticipatory" remarks and received instruction from color films; group C received instruction from black and white films; group D was read "anticipatory" remarks and received instruction from black and white films; and group E, the control group, received no formal instruction. The experimental groups saw four films, entitled "Library Organization," "Heredity and Environment," "Choosing Your Occupation," and "Your Earning Power." The three tests administered were: a pretest, a post-measure for acquisition, and a retention check six weeks after the film presentations.

The null hypotheses tested were: (1) There is no significant difference between the experimental and control

groups in immediate learning or retention of learning from either the color or the black and white guidance films; and (2) there is no significant difference between the experimental and control groups as a result of the "anticipatory" remarks. A series of covariance analyses indicated that it was possible to reject each of the foregoing hypotheses.

The following salient results were obtained:

(1) Black and white film emerged significantly superior to color film on measures for both acquisition and retention of factual information presented by selected guidance films.

(2) Groups who received instruction exclusively from films emerged significantly superior to groups who received instruction from films employed with "anticipatory" remarks, on measures for both acquisition and retention of factual information presented by selected guidance films.

The following conclusions seemed to be supported by the above results:

(1) The use of color in guidance films apparently does not aid the learner in either acquiring or retaining factual information.

(2) "Anticipatory" remarks, as employed in this study, do not help the learner in the acquisition or retention of factual information presented by guidance films.

243 pages. \$3.15. Mic 56-2214

#### A STUDY OF FACTORS AND PRACTICES RELATED TO HOLDING POWER IN CERTAIN MICHIGAN SECONDARY SCHOOLS

(Publication No. 16,753)

George Raymond Myers, Ph.D.  
Michigan State University, 1956

**The Problem.** A major problem confronting educators is that of encouraging young people to remain in secondary school. Specific purposes of this investigation were: (1) to trace the development of concern for improvement of school holding power; (2) to compare the holding power of Michigan secondary schools with related factors; (3) to examine holding power programs and practices in selected secondary schools; and (4) to develop recommendations for increasing holding power in secondary schools.

**Methods and Procedures.** A questionnaire was used to secure data from 441 Michigan secondary schools regarding school progress of 31,417 pupils who entered ninth grade in 1947, and general characteristics of the schools, their programs, their staffs and their students.

A follow-up questionnaire was used to obtain information from 94 selected schools regarding school progress, reasons for withdrawal, and problems related to holding power programs.

An interview schedule and check-list were used during visits to 15 selected schools, in addition to printed and mimeographed materials produced by the selected schools, as sources of information.

School administrators, guidance workers and teachers furnished the information used in the study. Data were tabulated and analyzed to provide a basis for the findings and recommendations.

**Findings.** Major findings of the study were:

1. Concern for improvement of school holding power is

related to acceptance of universal secondary education for all American youth.

2. Michigan graduates only 70 per cent of the pupils who enter ninth grade.

3. More boys than girls are among early school leavers at each grade level in Michigan secondary schools.

4. Nearly 60 per cent of early school leavers in Michigan high schools fail to complete the tenth grade.

5. School administrators list school-related factors, personal reasons and lack of finances as major causes of early school leaving.

6. Holding power is lower for transfer students than for pupils who enter ninth grade with the regular class.

7. The majority of early school leavers do not participate significantly in co-curricular activities.

8. A significant relationship exists between holding power and percentage of professional persons in the community.

9. Significant negative relationships exist between holding power and size of school enrollment, tenure of school superintendents and percentages of Negroes and other non-whites in the community.

10. No significant relationships exist between holding power and school organizational pattern, percentage of non-resident pupils, percentage of pupils in co-curricular activities, percentage of athletic contests won, tenure of principals, estimated attitudes of teachers, parents and other adults toward early school leavers, percentage of non-professional occupational groups, percentage of native-born whites, or percentage of foreign-born whites in the community.

11. When school administrators were asked to identify the major problem in increasing holding power, 80 per cent of the problems cited were school-centered.

12. Types of assistance desired by schools in developing holding power programs are printed materials, resource persons, conferences, and information on effective practices.

13. Holding power practices extensively used in Michigan include curriculum study and change, supervised work experience, early identification and counseling of potential leavers, follow-up of leavers, improved pupil transportation, conferences with pupils and parents, staff teamwork, recreational programs, and involvement of laymen in program planning.

**Recommendations.** The following recommendations are made relative to the improvement of holding power in Michigan secondary schools:

1. School staff members, pupils and laymen should formulate a community viewpoint based on education for all.

2. Schools should conduct continuous local holding power studies.

3. Curriculum appraisal and development should be initiated to provide variety and challenge to all pupils, in method as well as content.

4. Guidance services, including exit procedures, should be geared to local holding power requirements.

5. School workers should develop effective means of cooperation with parents. They should be familiar with current social, economic, industrial and agricultural trends in order to work more effectively with all pupils, including potential early school leavers.

6. Schools should utilize "status" pupils and adults to encourage potential early leavers to remain in school.

7. Schools should assist early leavers who wish to continue study on an evening, part-time or special basis.

8. Schools should devise pupil accounting forms and procedures which make it possible to assess holding power systematically and economically.

9. Research projects should be initiated to determine the effects of various procedures on local holding power.

10. Schools should inform citizens of relationships between non-school factors and holding power, and cooperate in efforts to minimize the impact of such factors on community well-being.

11. Schools should become active participants in the Michigan Secondary School-College Agreement program.

12. Members of the Michigan Association of School Administrators should be informed regarding the nature and extent of the holding power problem.

13. The Michigan Committee on School Holding Power should continue its program of gathering and disseminating holding power information.

14. The Michigan Department of Public Instruction and the Michigan teacher training institutions should make available consultant services and publications designed to assist schools in their holding power programs.

262 pages. \$3.28. Mic 56-2215

#### **AN INVESTIGATION INTO THE EFFECTIVENESS OF TWO METHODS OF INSTRUCTION IN ADDITION AND SUBTRACTION FACTS**

(Publication No. 16,600)

Morris Pincus, Ph.D.  
New York University, 1956

Chairman: Professor John J. Kinsella

#### **Statement of the Problem**

Modern educators are agreed that drill in arithmetic should follow the development of understanding. There is disagreement, however, as to the type of drill which should be used. One school of thought holds that drill should be practice through number relationships. The other school of thought holds that drill should be a repetitive activity without attention to number relationships.

The purpose of this investigation was to compare the effectiveness of two methods of teaching second decade addition and subtraction facts. One method developed the concepts and then used a type of drill which was based on relationships. The other method also developed the concepts, but then used a type of drill which consisted of repetitive practice and did not utilize relationships.

#### **Methods and Procedures**

The concepts underlying the second decade addition and subtraction facts were developed during grade three. At the end of that time, the children were divided into two groups and matched directly. These children were divided among four classes, each taught by a different teacher. To minimize the element of teacher ability and personality as factors, the roles of both teachers and their children were reversed during the course of the experiment.

During both phases of the investigation the experimental group used drill procedures based on number relationships while the control group concentrated on drill procedures and devices common before, as well as since, the develop-

ment of teaching arithmetic meaningfully. The addition part of the experiment lasted six weeks and the subtraction part six weeks. Then followed a seven-week period when neither group engaged in any activity in the area of addition and subtraction. At the end of the first six-week period both groups were tested for automatic recall of second decade addition facts as well as for ability to transfer this recall to higher decades. At the end of the next six-week period, both groups were tested similarly in subtraction. After the seven-week lapse of instruction, the groups were tested for retention. The results achieved by both groups were compared by finding the t ratio for the difference between the means.

#### **Conclusions and Discussion**

The results indicate that:

1. Both the experimental and the control groups show considerable gains regardless of the type of drill used.

2. There is no significant statistical difference in effectiveness between the two methods of instruction in second decade addition or subtraction facts.

3. Neither method shows a significant statistical difference in ability to transfer automatic recall of second decade facts to higher decades, to retain the automatic recall of second decade facts after a lapse of time, or to retain the ability to transfer the automatic recall to higher decades.

4. Although the results show no statistically significant difference between both methods of instruction, yet there appears to be a trend in favor of the drill through relationships method.

5. A comparison of gains made by pupils of comparable intelligence scores also indicates no statistically significant difference between the two methods of instruction, but the trend in favor of the experimental group still holds.

The considerable gains made by children taught by either method of instruction may be taken as an indication of the value of teaching arithmetic meaningfully when followed by drill. Since the drill through relationships method shows a trend in its favor, and since this method also tends to reinforce children's understanding of our number system, it would appear that teachers not at present using any drill through relationships might profitably incorporate such procedures into their methodology.

74 pages. \$1.00. Mic 56-2216

#### **THE DEVELOPMENT OF A TECHNIQUE TO MEASURE A COMPONENT OF CRITICAL THINKING IN THE PHYSICS AREA**

(Publication No. 16,991)

James J. Reilly, Ed.D.  
Boston University School of Education, 1956

This study is an empirical investigation of critical thinking, defined as a mental skill in the application of methods of logical inquiry and reasoning. A technique is developed for the measurement of a component of critical thinking, i.e. the ability to recognize the applicability of an idea to a specific problem situation. The study is limited to the physics area.

The specific problem situation structured takes the

form of a Science Scrapbook, realistically reproduced by photo-offset, and containing forty newspaper clippings. Items are matched to forty corresponding items in the Dunning Physics Test. These instruments were administered to the freshman class at the Boston University General College ( $N=293$ ) during a two hour testing period. Performance data on two hundred liberal arts freshmen at two colleges are obtained by way of clarification of the data on the General College sample.

Item construction consisted of the drafting of one hundred items. After analysis of these items in terms of content, vocabulary, and sentence structure forty items were selected as adequate. These items were submitted to an expert jury for opinion. Part of the jury was a science seminar of twenty members.

Item analysis procedures include: (1) item-difficulty values computed on Dunning and Scrapbook items; (2) item-discrimination values (Guilford phi) derived on Scrapbook items; and (3) number of testees passing and failing each Scrapbook item in relation to comparable Dunning item tabulated and tetrachoric correlations ( $r_t$ ) derived for all forty items.

Validation procedures include the computation of Pearson product-moment correlations between performance on the Scrapbook and Dunning Test, California Test of Mental Maturity, Cooperative Reading, General College Vocabulary Test, General College Sub-test (science), and Minnesota Spatial Relations. Content validation follows the work which went into the development of the Dunning Test. Correlations with the liberal arts group include Scrapbook vs Dunning, Cooperative Reading, ACE Psychological Examination, and high school physics grades. A reliability coefficient, using Kuder-Richardson formula 20 and uncorrected for attenuation, is derived.

Item analysis rendered the following empirical data. (Tables 13, 14, 15, 16, and 17). Item discrimination values rendered thirty-eight items as good in terms of a minimum cut-off established by Guilford for the computation of a phi coefficient with a population of 300. In terms of a maximum cut-off with the same population, twenty-eight items were found to be good. Six additional items were .25 or better. Criteria set by Guilford for  $r_t$  at .01 level of significance ( $N=300$ ) for varying combinations of  $p_1$  vs  $p$  rendered twenty-four good items. Four negative tetrachorics were found and one .01 and one .00.

Mean intelligence on the GC sample with the CTMM (total IQ) was 114.74 with a standard deviation of 11.65. Correlation between Scrapbook performance and intelligence was found to be .39. Cooperative Reading vs Scrapbook with the GC sample was .14. Scrapbook vs Dunning was .64. Significantly, a higher correlation was found between Scrapbook and GC Vocabulary Sub-test (science) which was .33 than between Scrapbook and total GC Vocabulary which was .20. Minnesota Spatial Relations vs Scrapbook was .18.

Empirical data on the liberal arts sample tends to confirm the findings with the General College sample. Mean intelligence on LA sample with the ACE Psychological Examination (total IQ) was 108.90 with a standard deviation of 20.33. Correlation between Scrapbook performance and intelligence was found to be .25. Cooperative Reading vs Scrapbook with the LA sample was .12. Scrapbook vs Dunning was .73. A correlation between high school physics grades with LA sample ( $N=83$ ) and Scrapbook was found to be .37. Mean school achievement in

physics was 79.69.

A Kuder-Richardson reliability coefficient (formula 20) was found to be .76 uncorrected for attenuation.

Evaluation of total empirical data derived suggests that the technique envisioned in the study might be developed into a sensitive instrument for the measurement of one component of critical thinking.

The general conclusion is that the Science Scrapbook is not an intelligence test nor a reading test. It is unrelated to what is known as spatial relations ability. Science content in the Scrapbook is about as expected from research to date. 103 pages. \$1.50. Mic 56-2217

#### PRINCIPLES AND FUNCTIONS OF OUTDOOR EDUCATION

(Publication No. 16,659)

Martin Humann Rogers, Ed.D.  
Syracuse University, 1956

The need for this study arises from the increasing interest in outdoor education on the part of individual teachers and schools who desire to employ outdoor experiences in the curriculum, and professional organizations such as the American Association for Health, Physical Education and Recreation, the American Association of School Administrators, the Association for Supervision and Curriculum Development, and the National Association of Secondary-School Principals. Through bulletins, articles, and experiments, these individuals and groups have contributed to the knowledge in the field of outdoor education, but there has been no single publication which analyzes the appropriateness, principles of use, and implications of outdoor education in the schools. There has been need for a publication which might serve as a guide to teachers and schools by defining and explaining the most desirable uses and principles of use of outdoor education.

To satisfy this need it is necessary first to establish a sound definition of outdoor education, to determine those curricular objectives unique to outdoor education, and to determine the guiding principles for the use of outdoor education. The philosophic approach used to accomplish these purposes attempts to answer the question, "What should be the definition, objectives, and principles, of outdoor education?" An analysis of the literature in outdoor education from 1925 to 1954 led to hypothesized statements of the most desirable definition, objectives, and principles. These hypotheses were then verified internally by ratings obtained from a panel of nine judges selected on the basis of experience and leadership in outdoor education.

These processes of analysis, reasoning, hypothesizing, and verifying resulted in the statements of definition, objectives, and principles which are the conclusions of this study. Outdoor education is defined as a method of approaching educational objectives through guided, direct, real-life experiences in the out-of-doors, utilizing as learning materials the resources of the natural environment. School camping is that phase of outdoor education which includes group-living experiences in the out-of-doors.

Twenty objectives for outdoor education were developed. These include: the enrichment and integration of the curriculum; the development of improved human relations,

better teacher-pupil rapport, self-reliance, and social responsibility; adjustment to the natural, physical, environment, better understanding of functional democracy and economics, and improved skill in the use of leisure time; the promotion of physical development, health knowledge, and sound health practices; the improvement of active school-community cooperation and understanding; and the increase in the capacity for purposeful work, scientific thinking, creativeness, and worthwhile emotional reactions.

Forty-nine guiding principles for outdoor education were developed. Emphasis is placed on the following points: outdoor education is an integral part of the curriculum and its activities take place during school time; outdoor experiences range from simple contacts with the natural environment to simple outdoor living, and they center on natural out-of-door resources and phenomena; democratic processes of pre-planning, activity, and final evaluation are shared by teachers and pupils; outdoor experiences are direct, real-life, purposeful activities; and the general administrative policies of the school are applied in the same manner to classroom activities and outdoor activities. Standards for teacher-pupil ratios, teacher preparation, and procedures for financing are also outlined as a guide for those schools who are considering the use of outdoor learning experiences.

333 pages. \$4.16. Mic 56-2218

**THE ABILITY TO IDENTIFY AND EVALUATE ASSUMPTIONS IN EIGHTH-GRADE GENERAL SCIENCE: A COMPARISON OF THE EFFECTIVENESS OF TWO TEACHING METHODS ON THE DEVELOPMENT OF THE ABILITY TO IDENTIFY AND EVALUATE ASSUMPTIONS**

(Publication No. 16,606)

Elizabeth Anne Simendinger, Ph.D.  
New York University, 1955

**Purpose**

The purpose of the investigation was twofold: (1) to determine the effectiveness of two teaching techniques upon growth in the ability of eighth-grade pupils to identify and evaluate science assumptions, and (2) to compare growth in this ability with growth in the ability to recognize non-science assumptions and with growth in general problem-solving ability.

**Procedure**

Nine classes were divided into three groups and taught general science for thirteen weeks. All groups were taught by a problem-solving method, differing in that Group I utilized teacher-planned experimental exercises and assumptions were stressed; in Group II, pupil-planned exercises were used and assumptions were stressed; Group C (control) used teacher-planned exercises with no emphasis on assumptions. Each group was given pre- and end-tests in subject matter, general problem-solving ability, the ability to identify science assumptions and the ability to evaluate them. The gains made were treated statistically by analysis of variance, using levels of I.Q. and sex as predictors and the teaching method as the variable, resulting in a three by three by two factorial design.

**Findings**

In no case was the control group superior to either experimental group. In knowledge of subject matter, Group I proved superior to Group C.

With respect to growth in both critical-thinking ability and the ability to recognize non-science assumptions, Groups I and II showed significantly greater gains than those made by Group C.

In regard to growth in both the ability to identify science assumptions and the ability to evaluate them, Group II was superior to Group C.

A very high correlation was found between the initial ability to identify science assumptions and the ability to evaluate them, and a substantial relationship found between knowledge of subject matter and I.Q., and between general problem-solving ability and the ability to identify both science and non-science assumptions.

A marked relationship was determined between gains in the ability to identify science assumptions and gains in the ability to evaluate them. A moderate correlation was found between general problem-solving ability and the ability to recognize non-science assumptions.

**Conclusions**

1. Unless emphasis is placed upon science assumptions, combined with pupil-planned experimental exercises, the pupils will not be aware of these assumptions.

2. As a result of stress on science assumptions, combined with either teacher- or pupil-planned experimental exercises, students will improve in their ability to recognize non-science assumptions and in general problem-solving ability.

3. A method using teacher-planned experimental exercises, stressing their assumptions, is superior to a method which also uses teacher-planned experimental exercises without the emphasis on assumptions, with regard to acquisition of subject matter.

4. No one sex or level of I.Q. appears generally superior to any other in any of the abilities studied.

5. A high correlation exists between the initial ability to identify science assumptions and the initial ability to evaluate them, while a marked relationship is evidenced between the developments of these abilities.

**Implications**

1. It is possible to bring about significant growth in problem-solving ability in a normal teaching situation, without loss of subject matter.

2. Of the techniques used, the teaching technique using most pupil participation, stressing science assumptions, yields the greatest growth in the ability to identify and evaluate science assumptions.

3. The abilities involved in problem solving, as the ability to identify and evaluate science assumptions, are distinct abilities.

4. The ability to identify science assumptions is either very closely related to the ability to evaluate them, or is identical with it.

5. Training in science assumptions does not appear to transfer automatically to non-science assumptions.

275 pages. \$3.44. Mic 56-2219

**A COMPARATIVE STUDY OF RETARDATION  
IN THE PRIMARY GRADES OF THE  
SAN DIEGO, CALIFORNIA, CITY SCHOOLS**

(Publication No. 16,946)

Robert Sylvanus Wallihan, Ed.D.  
University of Colorado, 1955

Supervisor: Professor Hubert H. Mills

The city schools of San Diego, California, employ various procedures for regulating the academic progress of their pupils. One of the practices used in an attempt to adjust class work to individual differences and to create uniform instructional groups is that of retardation or the requiring of pupils to repeat a full year's work. This retardation of pupils is particularly general in the primary grades of the elementary schools, although until the initiation of the present study no exact knowledge existed concerning the typical pupil who became retarded, or what the results of retardation were insofar as they were reflected in subsequent school achievement. The purpose of the study was to provide measures of central tendency and variability relating to the chronological age, mental age and reading age of an entire grade-generation of retarded pupils, and compare these data with the same statistics for a control group matched on the bases of sex and the intelligence quotient derived from the first grade group intelligence test.

A comparison was made of mean chronological age at time of entry to first grade of the retarded and control groups. The non-promoted group averaged nearly two months younger in first grade entry age; this difference was statistically significant. Comparison of sub-groups categorized by sex and grade repeated with the entire control group or with matched control groups, in most cases did not reveal significant differences. The differences between the groups in mean chronological age, measured after the retardation of the experimental group, was approximately ten months, and highly significant.

The usefulness of group tests of intelligence for the purposes of measurement and prediction in individual cases was tested by correlating first grade Pintner-Cunningham intelligence quotients against individual Binet intelligence quotients. This comparison was repeated for third grade Kuhlman-Anderson intelligence quotients. The obtained correlation coefficients were lower than commonly expected in such comparisons, but significantly greater than zero.

Reading performance subsequent to retardation, in grade four and again in grade six, was established for the two groups. By the time the fourth grade reading test was administered, the younger, regularly promoted control group showed a mean reading age six months higher than that of the retardees. This difference increased to more than ten months by the time grade six was reached and was significant with or without adjustment by multiple covariance for differences in first grade mental and/or chronological ages. The differences between the groups in mean improvement ratios, fourth grade reading to sixth grade reading, were not significant, although the ratio of the retarded group averaged lower than the ratio for the control group. Neither group reached 1.00 for mean improvement ratio.

The mean Kuhlman-Anderson intelligence quotient for the non-promoted group was 92.63. This was significantly lower than the mean quotient for the entire grade-generation, which was 102.00. The control group, originally matched to the retarded group on Pintner-Cunningham intelligence quotient, had a mean intelligence quotient of 96.21 for the Kuhlman-Anderson test.

The findings of the study support the following conclusions. No discernible evidence of improvement in reading occurs as the result of non-promotion. Uniformity of instructional groups in upper grades is not maintained by non-promotion in primary grades. Retarded pupils of this study seem to be a slower-learning group than their matched control group, and from the test results used in this study they seem to possess reading difficulties not remedied during seven years' attendance at the elementary schools.

181 pages. \$2.40. Mic 56-2220

**ENGINEERING**

**ENGINEERING, CHEMICAL**

**GAS PHASE RESISTANCE TO MASS TRANSFER  
IN A BUBBLE CAP COLUMN**

(Publication No. 17,409)

Billy Bob Ashby, Ph.D.  
University of Michigan, 1956

Adiabatic vaporization data for six gas-liquid systems have been obtained in a rectangular, five-plate, bubble cap column with one active plate. Mass flow rates, total pressure, pressure drop, clear liquid height, froth height, temperatures, and gas compositions were recorded.

The active plate had nine 1-1/2-inch bubble caps on a 2-1/2-inch square pitch. Each cap had eighteen 1/8-inch

by 3/4-inch slots, which extended to the tray floor. The plate was 7-1/2 inches wide and 13 inches long from the inlet downcomer to the outlet weir. A splash baffle was provided to smooth the flow over the outlet weir and to confine the bubbling action to the area above the bubble caps. One side of the column was sealed with glass to permit full visual observation of the bubbling action.

The operating conditions used with each system were a 1-1/2-inch weir height, a liquid rate of 8 gallons per minute, and a 3- to 4-fold range in gas flow rate. For the air-water system, data for a 2-inch weir height were also taken.

The purpose of this research was to evaluate the effects of fluid physical properties on the gas phase resistance to mass transfer in a bubble cap column. Data covering a wide range of fluid properties were obtained

with the following systems: (1) Helium-water, (2) Air-water, (3) Freon 12 (dichlorodifluoromethane)-water, (4) Helium-isobutyl alcohol, (5) Nitrogen-isobutyl alcohol, and (6) Helium-methyl isobutyl ketone. These systems gave a 30-fold range in gas density, a 1-1/2-fold range in gas viscosity, a 10-fold range in gas phase diffusivity, a 10-fold range in the gas Schmidt number, a 3-fold range in surface tension, and a 5-fold range in liquid viscosity.

The data were correlated with an average deviation of 6.7 per cent by the equation,

$$\frac{k_G a h P}{G_M} = 0.297 \left( \frac{\mu_G}{\rho_G D_V} \right)^{-0.23} \left( \frac{D_s \rho_G \sigma}{\mu_G} \right)^{-0.33} \left( \frac{D_s \rho_G \sigma}{\mu_G^2} \right)^{0.16} \left( \frac{h_L}{D_s} \right)^{0.62} \left( \frac{\rho_L}{\mu_G} \right)^{-0.01} \left( \frac{\mu_L}{\mu_G} \right)^{-0.005}$$

where  $k_G$  is the individual gas phase mass transfer coefficient,  $a$  the area available for mass transfer per unit volume of froth,  $h$  the effective froth height on the bubble tray,  $P$  the total pressure,  $G_M$  the molar gas mass velocity,  $\mu_G$  the gas viscosity,  $\rho_G$  the gas density,  $D_V$  the diffusivity of the vapor in the gas,  $D_s$  the width of the bubble cap slots,  $v$  the superficial gas velocity based on the active area of the plate,  $\sigma$  the surface tension,  $h_L$  the vertical distance between the bottom of the slot opening and the top of the clear liquid flowing over the weir (as calculated by the Francis weir formula),  $\rho_L$  the liquid density, and  $\mu_L$  the liquid viscosity. The fluid properties were evaluated at the average bulk conditions. Since the variables are arranged in dimensionless groups, any consistent set of units may be used. The equation is applicable only to the particular bubble plate used in this work, since only the effects of fluid properties were studied, and not plate design variables. However, the effect of the Schmidt number indicated by the equation is expected to be similar for bubble plates of different design.

A significant difference between gas phase resistances to mass transfer calculated from ammonia absorption data and those obtained from humidification data was noted and qualitatively explained.

149 pages. \$2.00. Mic 56-2221

#### THE RATE OF NITRATION OF BENZENE WITH MIXED ACID

(Publication No. 17,414)

Robert Dale Biggs, Ph.D.  
University of Michigan, 1955

This investigation was carried out to determine the effect of agitation, phase composition, relative extent of acid and organic phases, and temperature on the rate of nitration of benzene with nitric acid in mixed acid.

Data were taken with a laboratory scale, all-glass process unit designed for continuous operation. Steady state conditions were attained during each experimental run prior to the collection of data. Benzene and mixed acid were fed at constant flow rates to a stirred pot reactor where a finely dispersed emulsion of the reaction mixture was maintained. The acid and organic products overflowed into a separator from which each product drained into its respective product receiver. The feed reservoirs and product receivers were calibrated to

measure the materials flowing into and out of the reactor. A water bath around the reactor was maintained at a constant temperature to provide the necessary temperature control of the reaction mixture.

During each run the flow rates of the feed and product streams and the volume of the reaction mixture were measured. Samples of each stream were analyzed, and the reaction rate was calculated from the rate of conversion to nitrobenzene and the reaction mixture volume. Satisfactory material balances were attained for each run.

The effect of the degree of agitation was studied by varying the stirrer speed while holding the other variables substantially constant. It was found that the stirrer speed had no effect on the reaction rate at high speeds. This indicates that the resistance to mass transfer was reduced to a negligibly small value for most of the runs. There is evidence, however, that can be interpreted to suggest that mass transfer effects were appreciable for runs made with a volume per cent acid phase in the reactor below 50 per cent.

The temperature of the reaction mixture was varied from 34°C to 54°C; the acid phase composition was varied from 1.6 mol per cent nitric acid and 28 mol per cent sulfuric acid to 35 mol per cent nitric acid and zero mol per cent sulfuric acid; the organic phase composition was varied from four mol per cent benzene to 97 mol per cent benzene; and the relative extent of the phases was varied from 25 to 78 volume per cent acid phase.

The reaction rate correlates as a function of phase composition, phase ratio, and temperature; thus:

$$R = (1.233 \times 10^8) x_N x_B (V_A + 0.0252 V_A^2)$$

$$(x_N + 1.56 x_S - 0.23 x_W)^{\frac{8521}{T} - 13.23}$$

where

$R$  = mols nitrobenzene formed per hour per liter of total emulsion.

$x_B$  = mol fraction benzene in the organic phase on an acid free basis.

$x_N, x_S, x_W$  = mol fraction of nitric acid, sulfuric acid, and water respectively in the acid phase.

$T$  = absolute temperature, °K.

$V_A$  = volume per cent acid phase in reaction mixture.

This equation can be used for design calculations for commercial reactors since the data of this investigation in all probability represent limiting values of the reaction rate obtainable by ordinary means of agitation.

The data collected in this investigation permit a quantitative comparison with the rates of nitration of toluene at 35°C and in the range from 50 to 65 volume per cent acid phase. Thus, in the range of acid phase composition studied in this investigation toluene reacts with nitric acid in mixed acid from 1.8 to 9.7 times as fast as benzene.

105 pages. \$1.50. Mic 56-2222

CHEMICAL ENRICHMENT OF THE MANGANESE CONTENT OF AN ORE FROM THE BETTY BAKER MINE, GREAT GOSSAN LEAD, CARROLL COUNTY, VIRGINIA

(Publication No. 17,431)

George F. Meenaghan, Ph.D.  
Virginia Polytechnic Institute, 1956

Manganese and its alloys have many uses today, however, none of them approach its importance in the manufacture of steels. Without manganese the steelmaking industry would be very seriously handicapped and, unfortunately, the United States manganese deposits are very limited.

Many recent investigations have been concerned with the concentration of manganese in low-grade ores; the reason for this being the alarming shortage of high-grade manganese ores and the abundant supply of low-grade ores throughout the United States. It was found by a recent economic study of the complex sulfide ores of the Betty Baker Mine, Great Gossan Lead, Carroll County, Virginia, that the tailings from the bulk sulfide flotation process on the sample submitted contained approximately 3.6 weight per cent manganese, 2.3 weight per cent of which is acid-soluble.

It was the purpose of this investigation to study the possibility of enriching the manganese content of the ore from the Betty Baker Mine, Great Gossan Lead, Carroll County, Virginia, by employing a combination of roasting, leaching, and sintering processes. The satisfactory conditions for each process was investigated with respect to time of contact, temperature of operational process, and concentration of reagents used.

All of the bulk sulfide tailings that were used in this investigation were deslimed at 10 microns to remove a high percentage of iron and to effect a manganese concentration.

In the acid leaching of the deslimed bulk sulfide tailings, 25 volume per cent sulfuric acid removed 56.82 weight per cent of the acid-soluble manganese in 2 hours and 40 volume per cent nitric acid removed 36.70 weight per cent acid-soluble manganese in 7 hours, proving that sulfuric acid was more effective than nitric acid as a leaching agent for these tailings.

Sulfuric acid leaching of deslimed bulk sulfide tailings was more effective than sulfuric acid leaching of roasted deslimed bulk sulfide tailings or sulfated deslimed bulk sulfide tailings. These tests gave extractions of 56.82, 49.71, and 48.70 weight per cent acid-soluble manganese, respectively.

A sintering process was employed using the deslimed bulk sulfide tailings and sodium carbonate to increase the per cent acid-soluble manganese. The optimum sintering conditions were found to be a 1:0.5 deslimed bulk sulfide tailings to sodium carbonate weight ratio, 1100°C sintering temperature, and 45 minutes sintering time. These conditions yielded an increase in acid-soluble manganese from 2.202 to 3.650 weight per cent manganese in the sinter.

The manganese compound formed by sintering deslimed bulk sulfide tailings with sodium carbonate which is insoluble in sulfuric acid may be removed to the extent of 72 ± 2 weight per cent by sulfuric acid.

164 pages. \$2.15. Mic 56-2223

BUBBLE CAP TRAY EFFICIENCY CORRELATION

(Publication No. 16,949)

William Smolin, D.Ch.E.  
Polytechnic Institute of Brooklyn, 1956

The importance of bubble cap trays for industrial distillation and absorption operations has led to considerable interest in the fundamental factors required to predict bubble tray efficiencies. This study was carried out to 1) develop an improved quantitative characterization of vapor-liquid contact phenomena on bubble cap trays, and 2) apply this contacting mechanism to the prediction of Murphree point efficiency.

Froth height and density have been determined experimentally for the air-water system over a wide range of conditions. The studies were conducted on a model tower section having a single tray with a 10 x 12 inch active area. Three interchangeable trays having 1-1/2 inch caps on equilateral triangular and square layouts were used. Cap pitch was 2-1/2 to 3-1/2 inches. Other mechanical tray feature variations employed were: cap skirt clearance (0 to 1 inch); weir height (3/4 to 3-3/4 inches); slot submergence (0 to 3 inches); slot width (1/8 and 1/4 inch); slot height (1/4 to 3/4 inch); slot area (1.57 to 0.56 square inches per cap). Liquid and vapor flow rates were varied in the range 0.3 to 115 G.P.M./Ft. of Weir and 70 to 1600 Lb./Hr.Ft.<sup>2</sup>, respectively. The effects of surface tension, viscosity, and foaming characteristics of the liquid were also studied. Froth height was found to be a function of vapor rate, liquid rate, and weir height. Froth density was affected by these factors and by skirt clearance. Experimental results were interpreted by an analogy between the behavior of bubble tray froth and beds of fluidized solids. A correlation for vapor-liquid interfacial area, using this analogy, was based on the Chu-Kalil-Wetteroth equations developed for fluidized beds. Froth heights were correlated by an empirical expression. A procedure for predicting Murphree point efficiency was developed on the basis of the proposed contacting mechanism. Agreement between predicted efficiencies and values reported in the literature was shown.

Murphree point efficiency,  $E_{MP}$ , is determined quantitatively from the basic mass transfer equation

$$K_G a z_F \rho_V / G_V = -2.3 \log \left( 1 - \frac{E_{MP}}{100} \right)$$

where  $K_G$  is the overall mass transfer coefficient, ( $a$ ) is the interfacial contact area per unit volume of froth,  $z_F$  is froth height,  $\rho_V$  is vapor density, and  $G_V$  is vapor mass velocity based on active tray area. Interfacial contact area, ( $a$ ), is expressed in terms of a modified contact area,  $a'$ , which is a function of vapor rate and cap skirt clearance.  $a'$  is related to ( $a$ ) by a dimensionless interfacial area factor,  $\eta$ . The overall mass transfer coefficient is obtained from individual vapor and liquid film coefficients,  $k_G$  and  $k_L$ , which are calculated from relations developed from the froth-fluidized bed analogy. The factors comprising the efficiency expression may be evaluated from the following:

$$a = \frac{a'}{\eta}$$

$$a' = \frac{n_1 - n_2 G_V}{n_3 + G_V} + n_4, \text{ where } n_1 - - - n_4$$

are functions of cap skirt clearance.

$$\eta = 1.4 \times 10^6 G_V^{-1.6}$$

$1/K_G = \frac{1}{k_G} + \frac{m}{k_L}$  where  $m$  is the slope of the vapor liquid equilibrium curve.

$$k_G = (0.805) \frac{(\mu_V)^{0.44}(a')^{0.44}(G_V)^{0.56}}{(\rho_V)(Sc_V)^{2/3}}$$

$$k_L = 60 k_G \left( \frac{\mu_V}{\mu_L} \right)^{-0.44} \left( \frac{\rho_V}{\rho_L} \right) \left( \frac{Sc_V}{Sc_L} \right)^{2/3} \left( \frac{G_L}{G_V} \right)^{0.56}$$

$G_L$  is defined as  $\frac{8.03 \bar{L} \rho_L}{z_F}$  where  $\bar{L}$  is G.P.M. of clear liquid per foot of weir.  $\mu$ ,  $\rho$ , and  $Sc$  are viscosity, density, and Schmidt number, respectively.

$$z_F = \frac{z_W + \beta + 1.87 (1.0089)^{\bar{L}} (1.39 G_V \times 10^{-3})^{(2.12)(0.9824)} \bar{L}}{12}$$

where  $z_W$  is weir height and  $\beta$  is a function of liquid rate.  
188 pages. \$2.45. Mic 56-2224

#### CORRELATION OF FACTORS AFFECTING THE EXTRACTION EFFICIENCY IN A PULSE LIQUID-LIQUID EXTRACTOR

(Publication No. 17,432)

George T. Swisher, Ph.D.  
Virginia Polytechnic Institute, 1956

It was the purpose of this investigation to design and build an experimental two-inch pulse liquid-liquid extractor, and, using the system kerosene-phenol-water, to correlate the effects of pulse amplitude, plate spacing, plate-free-area, and pulse frequency on the stage efficiency of the column.

A two-inch experimental pulse-type extractor was constructed. The liquids were pulsed by means of a sylphon-type bellows operated by a push rod which was driven by an eccentric cam. For the satisfactory operation of the extractor various auxiliary apparatus was required; important among these were the supporting framework, the push-rod bearing, the reduction train for the cam, the storage tanks, and the tubing and fittings.

Operational flow rates were determined for the pulse extractor, and solubility, distribution, and transmittance data for the system kerosene-phenol-water were determined. Thirty-six individual experimental tests were performed, extracting phenol from kerosene with water, to determine the effects of the various parameters on the stage efficiency of the pulse column. During the experimental tests the following variables were studied: pulse amplitude at one, two, and three inches of vertical liquid displacement; number of plates with four, eight, and twelve plates; plate-free-area with eight, sixteen, and thirty-two per cent free area; and pulse frequency at 10.8 and 21.6 strokes per minute.

The experimental results were correlated by the following equation:

$$y = 91.62484 - 0.39510x_1 - 5.71618x_2 - 2.16334x_3 - 0.05240x_1^2 + 0.17734x_1x_2 + 0.04976x_1x_3$$

where:

$y$  = stage efficiency, per cent  
 $x_1$  = pulse number, inches per minute  
 $x_2$  = number of plates, dimensionless  
 $x_3$  = plate-free-area, per cent.

The average discrepancy between the experimentally determined and calculated values of the stage efficiencies was 35 per cent using the above equation.

The feed and solvent flow rates that should be employed for satisfactory pulse column operation were found to be 2300 and 2940 pounds per hour per square foot of column cross section, respectively.

207 pages. \$2.70. Mic 56-2225

#### ENGINEERING, ELECTRICAL

##### STUDY AND INTERPRETATION OF LOW ANGLE FLUCTUATIONS FROM THE RADIO STAR CASSIOPEIA AS OBSERVED AT ITHACA, NEW YORK

(Publication No. 15,618)

Braulio Dueño, Ph.D.  
Cornell University, 1955

The amplitude of the radio-waves received from the radio star Cassiopeia have been recorded at Ithaca, N.Y. since September, 1954. At lower transit this radio star makes a small angle with the horizontal at this latitude. Results obtained by analysing fluctuation data at the lower culmination trajectory of this radio star seem to indicate that these fluctuations are caused not only by spread F at the northerly regions but also by other layers of ionization at lower levels and that during the vernal solstice period when the sun-controlled forms of ionization are minimized at the polar regions, it is possible to obtain good agreement between fluctuation data at Ithaca and sporadic-E data from the Ottawa (320 km. north of Ithaca) ionospheric sounder station. Other experimental observations which seem to confirm these results are the notable difference in fluctuation rate between the winter period and the rest of the year and also the fact that a remarkable independence between the fluctuation rates and the K-indices exists during the winter period.

Two diffraction screen models are discussed at length. One is based on an ionospheric layer with corrugations and the known phenomena of fluctuations are interpreted in terms of the properties of this screen. The other model, due to Professor H.G. Booker is an elegant application of the Booker-Gordon scattering theory to radio star fluctuations. It is shown that results obtained by the Booker-Gordon theory are equivalent to results obtained by computing the mean square value of the phase change caused by the passage of a wave through a number of irregularities.

141 pages. \$1.76. Mic 56-2226

**THE SYNTHESIS OF MULTIPOLE CONTROL SYSTEMS**

(Publication No. 17,053)

Herbert Freeman, Eng.Sc.D.  
Columbia University, 1956

This thesis is concerned with the development of a direct synthesis method for multipole control systems. In spite of the large amount of work that has been done in the field of control engineering, relatively little attention has been given to systems having a multiplicity of inputs and outputs. Until this writing, no direct approach to the design of multipole control systems was possible. Most of the previous workers in this field were concerned either with the analysis of a specific system or with experimentation techniques using analog computers. The method developed here represents a "formal" approach to the synthesis problem.

The synthesis of multipole control systems is made difficult by the large number of parameters which are involved. To make an organized design possible, it is necessary to fix some of the parameters, without, however, putting undue constraints on the system performance which may be realized. The method developed here is based on first setting up a basic model of a multipole control system (canonical form) and then applying a constraint to the system to reduce the number of variables and permit the explicit solution for the transfer functions of the controllers. The constraint which is applied to the system is the requirement that the system outputs be independently controlled, i.e., that the outputs be noninteracting. This constraint does not limit the type of input-output coordinate transformation which can be achieved and its restrictive effect is trivial for all practical considerations.

A complete straightforward synthesis procedure is given in outline form. The definition of the basic form of a multipole control system and the imposition of a constraint to permit the explicit solution provide the framework for the method. It is shown how a system may be designed for specific steady-state errors through the use of an error-coefficient tensor. For transient responses it is shown that the same techniques are applicable that are used for the familiar twopole systems. A complete analysis of the stability problem is made and a technique is developed which permits the stabilization of multipole systems containing unstable elements. Full consideration is given to the problem of establishing the conditions on the overall system responses so as to give physically realizable forms for the controllers. The final design equations give the transfer functions of the controller elements directly in terms of the given controllable plant and the selected overall responses.

100 pages. \$1.50. Mic 56-2227

**A STUDY OF SPORADIC E ON A WORLD-WIDE BASIS**

(Publication No. 17,010)

Ernest Ketcham Smith Jr., Ph.D.  
Cornell University, 1956

This study attempts to describe sporadic E on a world-wide basis utilizing observations at high frequencies (HF)

with vertical-incidence ionosphere-sounding equipments (ionosondes) and at very high frequencies (VHF) of transmissions over oblique-incidence paths. An attempt is made to evaluate some of the consequences of this description in terms of possible energy sources of sporadic E.

Ionosonde data on sporadic E must be used with extreme care due to the fact that ionosondes are not calibrated for system gain and the sporadic-E critical frequency (fEs) is power sensitive. Particular attention is therefore paid to the errors which may be introduced.

Ionosonde results are analyzed for the occurrence of fEs greater than 5 Mc. The reasons for the choice of this limiting frequency are given in some detail. Three major zones are delineated on the basis of the temporal characteristics of the sporadic E in each. The Auroral Zone is separated from the Temperate Zone, for the purposes of this study, by the 15% auroral isochasm. A distinct Equatorial Zone is not observed on the night-time side of the globe, but is recognized on the daytime side within the bounds of plus and minus 10° of magnetic dip angle. Within the Equatorial Zone the customary phenomena of the Temperate Zone are found plus an additional type of sporadic E unique to the Equatorial Zone. The Es characteristics of these zones are then examined geographically for six time blocks and also temporally at a series of individual locations through time maps.

Treatment of the vertical-incidence data differs from that of previous studies chiefly in that the sunspot-cycle variation is here found to be a second-order effect compared to the other variations in the data and is consequently averaged out. An effective increase by a factor of five in the data sample is thereby obtained. A further difference in the treatment is that full geographical variation rather than variation of sporadic E with some latitude parameter is investigated. The VHF oblique-incidence data are treated in terms of transmission loss where possible. However, a study of some three thousand reports of television reception for which transmission loss could not be computed is also included.

New effects uncovered by this study are an outcome, first, of the parallel treatment of the vertical-incidence and the VHF oblique-incidence data and, second, of taking long-term averages of the vertical-incidence data. For example, the Temperate-Zone longitude effect was first suspected through intercomparison of VHF transmission-loss probabilities for United States and Japanese paths. Inspection of the vertical-incidence data covering seven years from the world-wide network of ionosondes confirms this effect in that a well-defined maximum in sporadic E is found to exist to the south of Japan. Similarly, in the investigation of correlation between magnetic activity and sporadic E a negative correlation is found in the Temperate Zone in vertical-incidence data. However, the effects of absorption could account for the observed correlation. In the VHF band the effects of absorption become unimportant and since the negative correlation is still observed it appears that this result is real.

The Phillips frequency-dependence rule is found to work quite well for occurrence of sporadic E on vertical-incidence sounders. An example is also given where this rule is found to apply, in a reinterpreted form, to oblique-incidence data.

The results of this study point towards a terrestrial energy source for Temperate-Zone sporadic E and an

extra-terrestrial one for sporadic E in the Auroral Zone. In the latter area it would appear that solar corpuscles are either directly responsible for much of the sporadic E or indirectly responsible through E-region currents. The Huancayo type of daytime sporadic E appears connected to the "equatorial electrojet".

298 pages. \$3.85. Mic 56-2228

## ENGINEERING MECHANICS

### ON CERTAIN PLANE STRAIN PROBLEMS FOR SOME PARTIALLY INFINITE DOMAINS

(Publication No. 17,412)

Gilbert Henri Beguin, Ph.D.  
University of Michigan, 1956

The problem studied is suggested by the design of gravity dams. For the purpose of analysis a mathematical model is chosen, the cross section of which ( $D_1$ ) is made up of a half-plane plus a right-angled triangle. The model is elastically homogeneous throughout. In the first case considered, the triangle has angles of  $90^\circ, 45^\circ, 45^\circ$ , and in the second, angles of  $90^\circ, 60^\circ, 30^\circ$ . The problem is one of plane strain, and according to the method of Muskhelishvili, can be reduced to the determination of two analytic functions  $\phi$  and  $\psi$  satisfying appropriate boundary conditions.

In part I, a solution is sought through conformal mapping of the region  $D_1$  onto a half plane. The mapping function  $w(z)$  involves the inverse of the elliptic  $\rho$ -function of Weierstrass. Because of the irrational character of  $w(z)$ , this analysis is limited to the reduction of the problem to one of classical integral equations.

In part II, the region  $D_1$  is regarded as made up of three infinite sectors joined along part of their boundaries. First the solution for the infinite sector of arbitrary opening angle and under loading, which can be represented by a Fourier integral, is fully developed. The functions  $\phi$  and  $\psi$  are expressed in terms of integrals of the type  $\int_{-\infty}^{\infty} f(t)z^{it}dt$ . This is applied to a three-quarter plane under hydrostatic load to yield a first approximation to the stress field in the lower upstream portion of a dam. As a second approximation a region  $D$  with one vertex less than  $D_1$  is considered;  $D$  is made up of two sectors. The plane strain problem then involves one of "matching," i.e., of re-establishing the physical continuity between the adjacent sectors. This problem reduces to a set of integral identities of a new type.

In part III, the plane strain problem is studied for the regions considered previously, but with fillets. The approach by means of conformal mapping leads to difficulties similar to those encountered in part I. As an approximation to the problem of finding the stress field in the neighborhood of fillets, the plane strain problem for a "smooth sector," i.e., an infinite sector with rounded-off vertex, is analyzed. Through an integral representation for  $\phi$  and  $\psi$ , this problem is reduced to four integral equations in the case of a  $3\pi/2$ -sector under a general

loading. For the case of a symmetrical normal loading only two integral equations remain.

In conclusion, this study gives the development of the general solution for the infinite sector, the formulation of the "matching problem" for two adjacent infinite sectors and the reduction to integral equations of the plane strain problem in the case of a smooth sector with an opening angle of  $3\pi/2$ .

218 pages. \$2.85. Mic 56-2229

## GRAPHICAL PHASE-PLANE METHODS IN DYNAMICS AND VIBRATIONS

(Publication No. 16,000)

Leo S. Packer, Ph.D.  
Cornell University, 1956

This study aims (1) to provide an exposition of the theory and application of phase-plane graphics, (2) to derive several exact, phase-plane trajectories which can be used to attack more difficult problems, (3) to illustrate the use of the phase plane in a variety of single-degree-of-freedom cases involving integration, differentiation, deduction of parameters, and handling of discontinuities, and (4) to show a straightforward application of phase-plane analysis to two problems of unsteady motion of two-degree-of-freedom dissipative systems.

Although the phase-plane concept is over 20 years old, its simplicity and generality especially for applied work and for pedagogy, have not been fully exploited. In deriving elementary phase trajectories, certain advantages of phase-plane descriptions of motion become evident. The quantities of interest in discussing the motion have physical analogues on the phase plane; the dynamics problem is often converted into a relatively simple geometric one. The linear motion is clearly a special case of the more general nonlinear motion. The transient motion and the steady-state motion are intimately related on the phase plane. Complete generality of initial conditions is a significant advantage in practical problems. Certain multi-degree-of-freedom problems can be treated without a prohibitive increase of complexity. Discontinuities caused by impacts, preload, backlash, and abrupt changes of spring and damping parameters can be shown very simply on the phase plane.

After the exact linear trajectories are defined by analytical methods, the construction of trajectories is broadened to include nonlinear and analytically-undefined characteristics. By replacing continuously varying characteristics with step-wise approximations, a greater generality is obtained. Jacobsen's method is illustrated, as are other proposed variations based upon different linear models. In special cases, transformations of the phase-plane coordinates are shown to simplify the trajectory and to facilitate interpretation of time intervals. A graphical method of deriving time markings on a phase-plane trajectory is derived.

The equations defining the velocity transformations of two particles in a dissipative impact are solved by a scaling procedure on the phase plane. Several illustrative examples show how portions of exact trajectories can be pieced together to show the action of various discontinuities in nonlinear motions of one and two-degree-of-freedom systems.

A chapter is devoted to methods of approximate integration and differentiation. It is also shown how unknown elastic or damping functions can be deduced graphically from transient response data. Although a completely general method of integration is indicated, it is concluded that special methods are easier to use when the problem permits a less general approach.

Two problems of unsteady motion of a nonlinear two-degree-of-freedom system are selected for detailed discussion. In the former, the coupling between the elastically-suspended main mass and a free mass contained therein consists of successive impacts at irregular time intervals; the problem thus describes the device known as the impact or shock damper. A sample graphi-

cal solution shows the effectiveness of the impact damper, which has received very little attention in the technical literature in this country.

The second problem substitutes a Coulomb friction force as the dissipative coupling between the main mass and the damper. Three different patterns of periodic motion are used as a basis for the graphical construction of the unsteady trajectory diagrams of the system. In both problems, the computation of the motion, while not difficult, is lengthy and tedious. The phase-plane diagram is straightforward and full of physical meaning; it can be constructed in a relatively short time and can be used both for qualitative and quantitative study.

163 pages. \$2.04. Mic 56-2230

#### FINE ARTS

##### THE LIFE AND ART OF WILLIAM J. GLACKENS (VOLUMES I AND II)

(Publication No. 14,459)

Vincent John de Gregorio, Ph.D.  
The Ohio State University, 1955

This is a study of the life and artistic development of William J. Glackens. More particularly, it is concerned with Glackens as an illustrator and, later, as a representative American artist who responded to the influences of American realism and French Impressionism, but in a wholly individual manner. It also seeks to analyze his participation in certain history-making movements to free and liberalize American art. These movements especially sought to achieve for the American artist the right to express himself without the restrictions of arbitrarily imposed standards and to exhibit his work without having to obtain the approval of authoritarian juries. The exhibitions of "The Eight," the staging of the first Independent Exhibition of 1910, the advent of the Armory Show, and the formation of the Society of Independent Artists were among the epoch-making events in which Glackens played a prominent role.

Because Glackens died less than two decades ago and because he did not experience spectacular success, the pertinent literary sources are rather scanty. The periodicals, especially newspapers, containing reviews of his work or accounts which mention his name as a participant in various art activities, and a few abbreviated biographical sketches, comprise the major published sources. Therefore, this study has had to depend largely upon the recollections of persons who knew the artist--relatives, friends, acquaintances, and professional associates--as well as upon personal papers--letters and journals--which many of these persons possess. The records and catalogues of galleries and museums and, finally, the collections, themselves, constitute the remaining and most important sources for the study of Glackens' art.

This study has revealed that in any consideration of the art history of the United States during the last years of the past century and the first four decades of the present cen-

tury, the name of Glackens appears significantly. Indeed, it would be difficult to disassociate him from any study of important artistic developments during these years. This is true not only as regards his manner of artistic expression but also with reference to his activities in the artistic environment of this country.

As an illustrator, Glackens has been regarded not only as one of the most original and forceful of his time, but also as one of the most significant in the history of American illustration. He is credited with influencing such celebrated illustrators as Wallace Morgan, Frederick Gruber, Henry Raleigh, and even his close friend, Everett Shinn.

Like his colleagues of "The Eight," Glackens refused to accept the conventional aesthetic modes of the academies, and he sought a more vibrant subject matter which he felt was vital in its feeling for warmth and human immediacy. However, although he rejected the rather moribund and somewhat sentimentalized art of his time, his choice of subject matter also differed from that of Sloan, Luks, and even Shinn, who frequently painted seamy and sordid themes. Rather, Glackens' art was "dedicated to the joy of living," as it preferred to depict the more elegant and happy aspects of life.

While his position as an artist was sufficiently prominent to assure him an important place in the history of American art, Glackens was throughout his career never sufficiently satisfied to stand aside and devote his energies to painting alone. Together with his colleagues and close friends, Sloan, Henri, Luks, Prendergast, and others, he played an important role in the Independent Movement, thus helping to better artistic conditions in this country, to increase opportunities for younger artists, and to encourage the American public to accept new ideas in art.

632 pages. \$7.90. Mic 56-2231

## FOLKLORE

### THE FOOD HABITS OF THE EAST SLAVS

(Publication No. 17,213)

Russell Blair, Ph.D.  
University of Pennsylvania, 1956

Supervisor: Dr. Alfred Senn

It is the purpose of this dissertation to attempt to make some contribution to the collected folklore of the East Slavic peoples by studying their food habits from the earliest times to date.

Foodways, as an integral part of the way of life, are inseparably linked to history. Consequently the historical-comparative approach is used in this study.

The problem is first dealt with chronologically. The first chapter deals with the origin of the Slavs and traces their migrations, thus establishing the formation of a distinct, independent East Slavic civilization.

In the four succeeding chapters the history of the East Slavs, from the beginnings to the present day, is divided into periods marked by significant historical events or developments. The first of these chapters, "Beginnings to the Rise of Moscow" receives the most detailed treatment,

since it serves as the base of comparison for succeeding chapters. This chapter establishes the agricultural nature of the economy and the grain orientation of the diet. It further delineates the role of meat (domestic and game), fruits, beverages and other food items in the diet. In succeeding chapters changes in the economy and in the diet patterns are noted, analyzed, and compared with the base period. There finally emerges the picture of the food habits of the Soviet citizen.

The importance of food in religious rites and observances was considered worthy of separate treatment, and a chapter has been devoted to it. The role of various food items in both pagan and Christian rites is discussed. Thereafter various food customs and traditions connected with religion are described.

Finally, a chapter is devoted to a study of some of the lexical problems presented by the names of some of the foods encountered in the study. Emphasis in this chapter is on the religious aspect of foods, since it is sometimes possible to determine from a philological study of the name of a ceremonial dish whether the rite of which it is a part is of pagan or Christian origin.

101 pages. \$1.50. Mic 56-2232

## FOOD TECHNOLOGY

### ISOLATION AND IDENTIFICATION OF ACIDIC AND NEUTRAL CARBONYL COMPOUNDS IN VARIOUS CHEESE VARIETIES

(Publication No. 17,376)

Emmett Washington Bassett, Ph.D.  
The Ohio State University, 1956

The purpose of the study was to separate and identify the acidic and neutral carbonyl compounds in eight varieties of cheese: Swiss, Cheddar, brick, Romano, Provolone, blue, Camembert, and Limburger.

By use of a paper chromatographic procedure, the 2, 4-dinitrophenylhydrazone derivatives of these compounds were separated and identified. The identity of the compounds was established by the following methods:  $R_f$  values, light-absorption analysis, decarboxylation of beta-keto acids and rechromatographing of the neutral carbonyl compounds, and melting-point determinations.

The most significant finding in this study was that the kind and relative concentration of the acidic and neutral carbonyl compounds were a definite characteristic of a given cheese variety. This relationship was found in all

eighty-two cheese samples analyzed. These findings could not be related to age or characteristic flavor intensity of the cheeses. From the acidic carbonyl compounds found in the cheese, the cheeses were classified into three groups based on the type of fermentation that took place during the ripening process. The first group included Swiss, brick, and Cheddar cheeses; the second group, Romano, Provolone, and blue cheeses; and the third group, Camembert and Limburger cheeses.

In Swiss cheese, five keto acids were identified: oxalsuccinic, alpha-ketoglutaric, oxalacetic, pyruvic, and alpha-acetolactic. Two neutral carbonyl compounds, diacetyl and acetyl methyl carbinol, were found.

In Cheddar cheese, alpha-ketoglutaric, aoxalacetic, pyruvic, alpha-acetolactic, and alpha-ketocaproic acid were identified; two neutral carbonyl compounds were found, diacetyl and acetyl methyl carbinol.

Brick cheeses contained alpha-ketoglutaric, pyruvic, oxalacetic, and alpha-ketocaproic acids.

Blue cheeses contained a large number of carbonyl compounds of both beta and keto acids. The alpha keto acids found were as follows: oxalsuccinic, alpha-ketoglutaric, oxalacetic, glyoxylic, pyruvic, and alpha-

acetolactic. The beta acids found were acetoacetic, beta-ketocaproic, beta-ketocaprylic, and beta-ketocapric. The neutral carbonyl compounds identified were diacetyl, acetaldehyde, acetyl methyl carbinol, acetone, pentanone-2, and two higher compounds.

In Romano cheese, the alpha-keto acids found were alpha-ketoglutaric, oxalacetic, two unknown keto acids, pyruvic, and alpha-acetolactic acids. The beta compounds were acetoacetic and beta-ketovaleric acids. Four neu-

tral carbonyl compounds were identified: diacetyl, acetyl-methylcarbinol, butanone-2, and acetone.

In Camembert and Limburger, a larger number of alpha keto acids were found: oxalsuccinic, alpha-ketoglutaric, oxalacetic, two unknowns, glyoxylic, pyruvic, alpha-acetolactic, alpha-ketobutyric, p-hydroxyphenyl-pyruvic and alpha-ketocaproic acids. Five neutral carbonyl compounds were identified: diacetyl, acetyl methyl-carbinol, acetaldehyde, acetone, and a C-5 saturated compound.

89 pages. \$1.50. Mic 56-2233

## GEOGRAPHY

### O PROBLEMA DO DESENVOLVIMENTO AGRICOLA DO SUDESTE DO PLANALTO CENTRAL DO BRASIL (THE PROBLEM OF AGRICULTURAL SETTLEMENT IN THE SOUTHEAST OF THE PLANALTO CENTRAL (BRAZIL))

(Publication No. 16,651)

Speridiao Faissol, Ph.D.  
Syracuse University, 1956

A presente tese trata do desenvolvimento agrícola do Sudeste do Planalto Central. Ela está dividida em três partes fundamentais. A primeira trata da qualificação das condições naturais e do desenvolvimento geral da região até o início do movimento pioneiro. Nesta primeira

parte aspectos do meio físico como formas do relevo, clima e solos e vegetação, são tratados, com o objetivo de prover ao leitor de uma base física indispensável entendimento de certas atitudes e objetivos do lavrador Brasileiro. A segunda parte trata da análise das áreas selecionadas em que específicos projetos de colonização foram desenvolvidos. Nesta análise são examinados os aspectos positivos e negativos da experiência, com o propósito de tirar proveito de experiências passadas para futuras tentativas.

Finalmente, são estudadas as possibilidades de desenvolvimento agrícola do Planalto Central, tendo em vista os atuais problemas com que se defrontam as atividades agro-pecuárias desta região, bem como os problemas correlatos de colocação dos produtos em um eventual desenvolvimento competitivo da agricultura no Brasil.

214 pages. \$2.68. Mic 56-2234

## GEOLOGY

### GEOLOGY OF THE LAKE MARY QUADRANGLE, IRON COUNTY, MICHIGAN

(Publication No. 17,377)

Richard William Bayley, Ph.D.  
The Ohio State University, 1956

The Lake Mary quadrangle is in eastern Iron County, in the west part of the northern peninsula of Michigan. The geology of the quadrangle was mapped as a part of a continuing project in the Upper Peninsula of Michigan by the U. S. Geological Survey in co-operation with the Geological Survey Division, Michigan Department of Conservation.

The area is underlain by rocks of Lower and Middle Precambrian age, formerly designated Archean and Algongian, and is extensively covered by Pleistocene glacial deposits. A few Upper Precambrian (Keweenawan) diabase dikes and two remnants of Upper Cambrian sandstone and dolomite are also present.

The major structural feature is the Holmes Lake anti-

cline, the axis of which strikes northwest through the northeast part of the area. Most of the area is underlain by rocks of the west limb of the anticline.

Lower Precambrian rocks are represented by porphyritic red granite, which may be the oldest rock in the district, and by the Dickinson group, which is composed chiefly of metavolcanic schist. The Dickinson group underlies the core area of the Holmes Lake anticline, which is flanked by steeply dipping Middle Precambrian (Huronian) formations. A major unconformity separates the Dickinson group from the overlying Middle Precambrian rocks.

In ascending order, the Middle Precambrian formations are the Randville dolomite (Lower Huronian), the Hemlock formation, and the Michigamme formation (Upper Huronian). Unconformities probably separate the Hemlock and Michigamme formations and the Hemlock and Randville formations.

The Randville formation is composed chiefly of dolomite, arkose, and slate; the Hemlock is chiefly altered volcanic rocks; and the Michigamme is chiefly altered

graywacke and slate. The Mansfield iron-bearing slate member of the Hemlock formation contains a chert-siderite iron-formation.

Two periods of regional metamorphism have caused the alteration of almost all of the rocks of the quadrangle. The Lower Precambrian rocks underwent at least one period of metamorphism, folding, and erosion before the Randville formation was deposited. After the deposition of the Michigamme formation, a late Middle Precambrian period of regional metamorphism occurred, with attending deformation and igneous intrusion.

The Middle Precambrian rocks are cut by intrusives of different types and several different ages. Gabbroic sills and dikes invaded the Hemlock rocks at some time after the Hemlock was deposited and before the late Middle Precambrian orogeny and metamorphism. One of the sills, the West Kiernan, is well differentiated. A syntectonic igneous body, the Peavy complex, composed of gabbro with minor ultrabasic parts and fringed with intermediate and acid differentiates and hybrids, intruded the Hemlock and Michigamme formations during the late Middle Precambrian orogeny and metamorphism. The complex is situated near the crest of the regional metamorphic node. The regional metamorphic effects are superposed on the contact metamorphic rocks peripheral to the complex, and on the rocks of the complex as well.

The folding and faulting in the quadrangle date from the late Middle Precambrian orogeny.

Diabase dikes, probably of Keweenawan age, have intruded the deformed and metamorphosed Huronian rocks.

The only metallic resource is iron ore. The Mansfield mine produced one and one-half million tons of high-grade iron ore between the years 1890 and 1913. Sporadic exploration since 1913 has failed to reveal other ore deposits of economic importance.

304 pages. \$3.90. Mic 56-2235

dolomitic shale, and limestone lithofacies. In the Lilley formation the crinoidal carbonate, argillaceous carbonate, and dolomitic shale lithofacies are described. Depth of water and source of clastic sediment were the most important factors determining the various Niagaran lithotopes in Highland County. The introduction of the crinoidal carbonate lithotope was apparently caused by a reduction in the depth of water, and may, therefore, date a movement of the Cincinnati arch. In the area studied, the upper part of the Bisher formation passes westward and north-northwestward into the lower part of the crinoidal carbonate lithofacies.

The Peebles formation is Guelph in age and is correlated with the upper part of the Huntington formation in Ohio and northern Indiana. It is believed that the crinoidal carbonate lithofacies of the Lilley formation continues north-northwestward into the Cedarville formation. The Bisher formation is equated with the Springfield and Euphemia formations in southwestern Ohio. The Alger formation in Highland and Adams counties is regarded as having approximately the same stratigraphic limits as the combined Massie, Laurel, and Osgood formations in Clark and Greene counties, Ohio. A correlation of Niagaran formations between Ohio, Indiana, northeastern Illinois, southeastern Wisconsin, southern Ontario, and western New York is proposed.

Seventy species were collected from 75 Niagaran units at 36 localities in Highland County. These species are described and figured. *Acervularia ananas carmani* and *Streptelasma pygmaeum foerstei* are described as new varieties. A number of species have been added to Foerste's faunal lists for the Alger, Bisher, Lilley, and Peebles formations. Forty species were added to the Lilley fauna, in part because of the presence of many Bisher forms in its lower beds. Although corals are represented throughout the Niagaran in southern Ohio, their major development began with the crinoidal carbonate lithotope of the Lilley formation and continued to the close of the Niagaran epoch. 266 pages. \$3.45. Mic 56-2236

#### STRATIGRAPHY AND PALEONTOLOGY OF THE NIAGARAN SERIES IN HIGHLAND COUNTY, OHIO

(Publication No. 17,379)

Richard Spencer Bowman, Ph.D.  
The Ohio State University, 1956

The Niagaran series in Highland County, Ohio, has interested geologists for many years. Orton and Foerste have contributed greatly to present knowledge of the stratigraphy and paleontology of these strata. However, it has been difficult to correlate Niagaran formations in southern Ohio (Highland and Adams counties) with strata composing this series elsewhere in Ohio. The difficulty arises primarily from lithologic and faunal changes that occur in the Niagaran formations along the east flank of the Cincinnati arch. Foerste's correlation of these formations in southern and southwestern Ohio (1931, p. 173) is unsatisfactory, for it implies several breaks in deposition within the series for which there is no evidence.

The Bisher and Lilley formations are composed of several different types of carbonate deposits. These lithologically distinct strata are treated as lithofacies, and their respective lithotopes are interpreted. The Bisher is subdivided into the silty carbonate, *Cryptothyrella*,

#### QUANTITATIVE GEOMORPHOLOGY OF SMALL DRAINAGE BASINS OF SOUTHERN INDIANA

(Publication No. 17,048)

Donald Robert Coates, Ph.D.  
Columbia University, 1956

Morphometric analysis of six small areas in the unglaciated part of southern Indiana provided data for determination of influence of lithology, per cent of unconsumed upland (stage of cycle), and regional relief upon scale and form properties of third-order drainage basins measured in the field and from topographic maps and air photos. Ten drainage basins in each of six different localities were compared with respect to length dimensions of area, perimeter, overland flow, stream lengths, drainage density, and local relief, and with respect to dimensionless form properties of valley-side slopes, stream gradients, hypsometric curve forms and integrals, bifurcation ratios, length ratios, circularity, and azimuth relations of slope and channels. Differences between areas were tested for significance by the analysis of variance.

Lithology appeared especially important in determining the scale of the topographic units as reflected in stream lengths, basin areas, perimeters, lengths of overland flow, and drainage densities. Rock type also influences, in part, some of the dimensionless form measures of a basin; is important in controlling steepness of valley-side slopes; and perhaps may influence, although not to so great an extent, the stream gradients.

Per cent of unconsumed upland (stage of cycle) is most clearly correlated with length of overland flow, expected because streams will continue to grow and reduce the length of overland flow until the upland surfaces have been narrowed to the point of disappearance. In general, when youthful areas are compared with mature areas, the latter tend to show steeper valley-side slopes.

Although regional, or available, relief might be anticipated as a major control of morphology, because it would determine the potential energy of the stream system, such effects were either not present or were masked by other controls in southern Indiana.

When compared with other regions in the humid eastern United States, the morphology of southern Indiana basins shows close conformity in some of the form elements, as circularity, bifurcation ratio, drainage density, and stream length ratio. Some dimensionless qualities, however, such as maximum valley-side slopes, stream gradients, and hypsometric integrals, that might be supposed to be similar, actually show wide ranges which prevent regional generalizations.

Important discrepancies exist between measurements obtained by use of the relatively small-scale topographic maps (U.S.G.S. 1:24,000) and data obtained from specially surveyed, large scale field maps (1:600). In the southern Indiana localities many basins, which appear as first or at most second order basins on the maps of 1:24,000 scale, prove to be of fourth order when mapped in the field. Order of these streams can often be increased to third order by use of stereopairs to complete the drainage network. Some generalizations may be made as to characteristic evolutionary stages of erosional development of regions of sedimentary strata in a humid continental climate: Youth is a time of maximum areal extension of drainage basins; proportion of undissected upland diminishes with age; valley-side slopes and stream gradients are increasing in steepness; stream length ratios may be quite large; relatively low basin circularity prevails; and hypsometric integrals are large. When full maturity of a region is attained all uplands have been consumed; local relief is at the maximum; slopes have developed maximum average steepness and are approximately the same for first and second order valley-wall sides; and stream gradients remain steep. During late maturity the region has maximum circularity of basins; stream lengths are more nearly equal; valley-side slopes and stream gradients have declined in steepness with valley-wall retreat.

124 pages. \$1.65. Mic 56-2237

## THE PETROGRAPHY, MINERALOGY, AND ORIGIN OF PHOSPHATE PELLETS IN THE WESTERN PERMIAN FORMATION AND OTHER SEDIMENTARY FORMATIONS

(Publication No. 16,954)

George Donald Emigh, Ph.D.  
University of Arizona, 1956

Supervisor: Frederic W. Galbraith

Sedimentary phosphate deposits are of interest scientifically and economically. Our knowledge of the exact mode of occurrence, mineralogy, and origin of the pellet phosphate deposits leaves many questions unanswered. The main purpose of this work is to present data, general information, and suggestions which may help answer some of these questions.

Specimens for chemical analysis and petrographic examination were collected from different sedimentary phosphate deposits in the United States. The formations covered include: the Permian formation of Montana, Idaho, Wyoming, and Utah; the Ordovician formations of middle Tennessee; the Pennsylvanian formation of northern Arkansas; and the nodular phosphorites on the sea floor off the coast of California.

Petrographic examination reveals the phosphate to be similar in physical form and mineralogy in all the formations studied. Physically, the phosphate is present as rounded pellets of diverse origin. A classification of five pellet types has been set up -- fossil, encased, nodule, oolite, and multiple. Mineralogically, the pellets are microcrystalline aggregates of what appears to be one mineral. This is the carbonate-fluorapatite mineral francolite.

It is proposed that the phosphate pellets are replaced calcium carbonate pellets. The carbonate pellets were formed originally on the sea floor by the action of ocean currents. The phosphate was derived from normal sea water and is not dependent on unusual concentrations of phosphorus or necessarily on ocean conditions favorable to chemical precipitation of calcium phosphate.

If the hypothesis of formation and origin of the phosphate pellets is correct, phosphate can be formed under any marine conditions but will be more concentrated under certain conditions.

The confusion as to the definition of the term "phosphate" is reviewed and a new definition proposed.

A new classification of sedimentary phosphates is proposed.

The geology of the western Permian phosphate formation is reviewed briefly and is augmented with a few special comments on the formation in southeastern Idaho. Among these is the proposal that the microcrystalline quartz of the Rex Chert member of the Phosphoria formation is derived from the diagenesis of beds of siliceous sponge spicules.

352 pages. \$4.50. Mic 56-2238

SEVEN SOIL PROFILES IN NORTHERN NEW JERSEY: A STUDY OF THE FACTORS IN THEIR GENESIS AS SHOWN BY CERTAIN OF THEIR MORPHOLOGICAL, PHYSICAL, CHEMICAL, AND MINERALOGICAL CHARACTERISTICS

(Publication No. 16,682)

Robert Dixon Krebs, Ph.D.  
Rutgers University, 1956

Seven soil profiles formed in glacial drift in New Jersey were investigated to define some of their important genetic characteristics and clarify concepts on the relative influence of climate, time, vegetation, and parent materials in their development. Soil morphology, parent-material character, and plant-cover constitution were studied to evaluate their interrelationships. The program of laboratory work was designed to procure information on the occurrence and distribution of primary minerals and weathering products in the soils, the intensity of weathering at various depths in the soil profiles, and the nature of the soil-forming processes that have prevailed.

Pronounced variations among soils in Wisconsin drift have resulted from variations in parent materials: a Podzol has formed in acid, highly quartzose Cary till; a Gray-brown Podzolic soil with strongly expressed profile morphology has formed in highly calcareous Cary till; a Gray-brown Podzolic soil with weakly expressed profile morphology has formed in gneissic Tazewell till that originally contained a small amount of carbonate rock; and an Acid Brown Forest soil has formed in Tazewell till of a purely gneissic type.

Clay mica constitutes most of the clay in the soils associated with Wisconsin drift. This clay is allogenic illite and/or well-crystallized mica in the C horizon, mixed-layer hydrous micas in the B<sub>2</sub> horizon, and, except for the Podzol, vermiculite-like clay mica in the A<sub>2</sub> horizon. In the Podzol, the vermiculite is contained in the upper B<sub>2</sub> horizon, probably by virtue of translocation downward, and mixed-layer hydrous micas is in the A<sub>2</sub> horizon. Associated with the clay mica are small amounts of kaolinite and quartz.

The soils in pre-Wisconsin drift do not express differences in parent materials as strongly as the soils in Wisconsin drift. Two Gray-brown Podzolic soils are similar in many of their properties although one formed in gneissic Illinoian drift while the other developed from gneiss, probably bedrock, glaciated by Kansan ice. A Red Podzolic soil has formed in gneissic Illinoian drift where the original presence of carbonate rock is suspected.

The soils in pre-Wisconsin drift contain small amounts of clay mica. This is weathered in the same manner and to virtually the same degree, horizon for horizon, as that in the soils in Wisconsin drift. From this and the fact that podzolization is expressed no more emphatically in the soils in older drift than in some of the soils in Wisconsin drift, it is concluded that the older soils underwent appreciable podzolization only during post-Wisconsin time.

Kaolinite and, in the case of the Red Podzolic soil, gibbsite form a major portion of the clay in the soils in pre-Wisconsin drift. These minerals are proportionately most abundant in the C horizon and least abundant in the A<sub>2</sub> horizon. The gibbsite and kaolinite may be a product of a lateritic-like soil-forming process that possibly pre-

vailed during the Sangamon interglacial interval. In view of this the probability is entertained that climate during Sangamon time was considerably warmer than now.

169 pages. \$2.11. Mic 56-2239

ZIRCON STUDIES IN SILICIC IGNEOUS ROCKS

(Publication No. 17,065)

Leonard H. Larsen, Ph.D.  
Columbia University, 1956

Zircons of silicic igneous rocks may be studied by measurements of length along the c-axis and breadth along the a<sub>1</sub>- or a<sub>2</sub>-axis, for a representative sample of two hundred crystals. The results are represented graphically by contoured scatter diagrams, cumulative frequency curves of elongation, and by a calculated fitted line, the reduced major axis. In the last treatment the sample is characterized by its mean size, size range, slope of the reduced major axis, and relative dispersion of measurements about this line. Several samples may be compared visually on the same diagram. Differences of slopes and means may be tested statistically. Contoured scatter diagrams and cumulative frequency curves of elongation have advantages as graphic representations of results in cases of bimodal or similar mixed distribution of size and shape of zircon crystals.

Laboratory methods have been tested in a study of zircons in a tonalite. Largest experimental errors in sample preparation are due to non-standardized laboratory procedures and to division of concentrates prior to mounting on slides. A standard procedure is recommended which assures concentration of a representative zircon sample from most silicic igneous rocks. Distribution of zircon in the mineral fabric of a second tonalite was studied by measurement of zircon concentrates prepared from the rock and from each of the main constituent minerals, with parallel studies of thin sections. The zircons are shown to have crystallized before the main constituent minerals and to have had a short range of crystallization. Crushing liberates zircons with negligible breakage, chiefly from minerals with good cleavage.

The size and shape of zircons in an igneous rock reflect the physico-chemical environment during zircon crystallization. It is shown that zircons are uniform throughout the Hanover-Fierro intrusive (New Mexico) and the Bald Mountain batholith (Oregon), and do not vary with rock type in these plutons. It is concluded that the zircons crystallized in uniform physico-chemical environments, likely only in the initial stages of consolidation. These plutons are therefore magmatic (*sensu stricto*).

Zircons of the Bald Rock batholith (California) vary with rock type, and two distinctly different types of zircons are present in different proportions throughout this pluton. The presence and distribution of these two zircon types, as well as the structural and petrological relations of the rocks, render it likely that the batholith consists of a parautochthonous mantle and an intrusive core. Zircons of the Kaniksu batholith (Idaho-Washington) are also shown to vary within the pluton. These variations cannot be interpreted since field relations are not known in detail.

67 pages. \$1.50. Mic 56-2240

**ORIGIN AND OCCURRENCE OF BARITE  
IN ARKANSAS**

(Publication No. 16,981)

Berton James Scull, Ph.D.  
The University of Oklahoma, 1956

Supervisor: Dr. C. A. Merritt

About one-quarter of the world's production of barite is mined from one deposit in the Chamberlin Creek syncline in the Magnet Cove district of the Arkansas Barite region. Barite is obtained by strip mining in the eastern part of the deposit, and by underground methods in the western part. Mode of origin, time of emplacement, paragenesis, and genetic relationships of this and adjacent barite deposits were determined by an integration of information obtained by mapping the deposits, and chemical, spectrographic, and petrographic data obtained by analyses of selected samples.

This region includes portions of the Ouachita Mountain System and the Gulf Coastal Plain. The Ouachita Mountains consist of strongly deformed Paleozoic sedimentary rocks. The Gulf Coastal Plain consists of low-dipping poorly consolidated Mesozoic and Cenozoic sediments. The sediments of these provinces were intruded by sub-silicic igneous rocks of lower Upper Cretaceous age. These igneous rocks are comparatively rich in barium, strontium, titanium, and carbonate.

The region is subdivided into six barite districts. In three districts the barite occurs as a replacement deposit in the basal part of the Stanley formation, which is Mississippian in age. The other three districts are dissimilar. The types of barite occurrence in them are barite in concordant veins in the middle division of the Arkansas novaculite, barite as gangue material in discordant veins in cinnabar deposits, and barite as cement in Lower Cretaceous Trinity sands and gravels.

The replacement deposits were formed through metasomatic processes by which the barite replaced quartz, mica, and clay in the lower part of the Stanley formation. The concordant and discordant veins were emplaced along planes of weakness in the host rock. The barite cement was deposited from hydrothermal solutions in contact with formation waters.

The abundance of barium, strontium, and titanium in the igneous rocks, and of strontium and titanium in the barite deposits, similar trace elements in the igneous

rocks and the barite in each type of deposit, and the spatial and temporal relationships of the igneous rocks, barite deposits and metalliferous deposits of the region indicate a common origin—hydrothermal—for all of the barite deposits.

289 pages. \$3.75. Mic 56-2241

**STRATIGRAPHY AND ECONOMIC GEOLOGY  
OF THE CHINLE FORMATION,  
NORTHEASTERN ARIZONA**

(Publication No. 16,956)

Robert Lee Wilson, Ph.D.  
University of Arizona, 1956

Supervisor: Evans B. Mayo

The Chinle formation was studied in detail at the Paint Pots; then by a reconnaissance covering other parts of the Navajo Indian Reservation, northeastern Arizona. Twenty-eight geologic sections were measured, sampled and tests were conducted on some of the clays to determine their physical and mineralogic characteristics.

The Petrified Forest member of the Chinle was divided into the Red Brown Mudstone, Tan Gray Sandstone, Bentonitic, and Gray Sandstone units on the basis of lithology, sedimentary structures and dominant grain size. A suggested Lower member includes all strata between the Petrified Forest member and the Moenkopi formation. A continuous sequence of alluvial sedimentation in a basin with exterior drainage is indicated. Coarse Shinumo sediments were deposited immediately after the rapid rise of three probable source areas. The fresh water limestone at the top of the Chinle represents the final stage of deposition in a clogged drainage system. A large volume of volcanic ash, now altered to bentonitic clay, was introduced early in Chinle time. The upper limestone and the undisturbed ash bed both represent time lines.

Uranium minerals occur in important quantities in both the Petrified Forest and Lower members of the Chinle. Tests indicate that beneficiated bentonitic clay has potential value for canal lining and other uses.

332 pages. \$4.25. Mic 56-2242

## HEALTH SCIENCES

### HEALTH SCIENCES, PHARMACY

#### THE EFFECTS OF CERTAIN MEDICINAL COMPOUNDS ON THE ACTIVITY OF TERRAMYCIN

(Publication No. 16,936)

Martin Ellis Hamner, Ph.D.  
University of Colorado, 1955

Supervisor: Professor Charles F. Poe

The interrelationships between antibiotic substances and other chemotherapeutic agents are becoming increasingly important as the field of antibiotic therapy expands. Of equal interest to physicians and investigators is the question of mode of action of antibiotic agents and other chemotherapeutic agents.

One approach to the problems of drug relationships and mode of action is through the accumulation of empirical knowledge of the behavior of specific combinations of the respective compounds. In the present investigation, experiments were conducted by using terramycin and a number of representative members of three separate types of chemical compounds: Amino acids, antihistaminic agents, and inorganic metallic salts. The tests were conducted against Micrococcus pyogenes (var. aureus) by means of the agar plate diffusion method. Each compound was tested alone and in combination with terramycin. Tests were performed immediately after preparation of solutions of the respective compounds. Stability tests were conducted after allowing the solutions to stand 48 hours at room temperature. Compounds which gave indifferent results in

preliminary screening tests were eliminated; other compounds were tested further in several concentrations against a series of concentrations of terramycin.

Among the amino acids tested, cysteine was found to produce strong inhibition of the test organism and to potentiate the activity of terramycin. The combination was stable for at least 48 hours. The finding was in conflict with the antagonistic effect of cysteine on the activity of penicillin and certain other antibiotic agents. Histidine also potentiated and stabilized the activity of terramycin. The other amino acids tested were found to give negative results.

Eight of the antihistaminic agents tested showed inhibitory activity against Micrococcus pyogenes (var. aureus) and increased the activity of terramycin. In addition each of the eight compounds appeared to stabilize the activity of terramycin for at least 48 hours. Either a synergistic or additive effect was indicated. Three of the antihistaminic agents examined produced very slight or indifferent results and were reported as negative. Trimeton maleate appeared to be antagonistic to terramycin under the experimental conditions employed.

The most noticeable effect of the inorganic metallic salts was antagonism. The sulfates of aluminum, nickel, and copper each reduced the activity of terramycin. The effect was extremely pronounced with ferrous sulfate which destroyed or greatly reduced the activity of the antibiotic even in high dilutions. Of the metallic salts tested, only zinc sulfate appeared to be compatible with terramycin. The amount of inhibition produced by a combination of zinc sulfate and terramycin was greater than the effect of either compound when used alone. 78 pages. \$1.50. Mic 56-2243

## HISTORY

### HISTORY, ANCIENT

#### SSU-MA CH'IEIEN: THE HISTORIAN AND HIS WORK

(Publication No. 17,087)

Burton DeWitt Watson, Ph.D.  
Columbia University, 1956

The purpose of this study is to introduce to the western reader one of the earliest and greatest of Chinese historians, Ssu-ma Ch'ien (145-90? B.C.), and his life work, the Shih chi or Records of the Historian. The Shih chi, a work in one hundred thirty chapters covering the history of China and neighboring countries from the earliest recorded times down to the age of the historian, has had an incalculable influence upon the literature and thought of

China, Japan and Korea. For over two thousand years it has been studied and admired by scholars of these countries and has served as the model for many later historical works of importance.

The study first attempts to outline the early history of China as it was conceived by Ssu-ma Ch'ien and to describe in some detail the age in which the historian lived and wrote. This is followed by an annotated translation of the biographies of his father and himself appended by Ssu-ma Ch'ien to his history, as well as of the sections added to Ssu-ma Ch'ien's biography by Pan Ku (32-92 A.D.), principal author of the Han shu or History of the Former Han Dynasty. A study has been made of the beginnings of Chinese historiography and the influence of the Spring and Autumn Annals, traditionally supposed to have been compiled by Confucius, upon the Shih chi.

There follows a description of the various formal divisions of the Shih chi with a discussion of their possible derivations and the ways in which they were adopted or changed by later historians. Several sections have been devoted to an examination of Ssu-ma Ch'ien's theories of history and literature and the literary aspects of his work. The study concludes with translations of passages selected from the Shih chi to illustrate the more important characteristics of Ssu-ma Ch'ien's thought, methods and style.

The aim of the study has been to give as comprehensive a picture as possible of the nature and scope of the Shih chi and its importance in Chinese literature and historical thought, while at the same time unavoidably passing over a number of important but more specialized questions such as textual transmission and criticism. Attempts have been made wherever possible to relate or compare the Shih chi to western historical works and to suggest to the reader some of the qualities of greatness which have made it a classic in the literary heritage of eastern Asia.

287 pages. \$3.70. Mic 56-2244

Hussites and one of them, Hans Giesser, was burned at the stake. In 1418 the Austrian Hussites had become troublesome enough to force Duke Albrecht V into publishing an edict directed at them. The Hussite wars which began soon afterwards, far from turning the bulk of the population of Austria against the Hussites, made further converts to their cause in Austria. The Hussite armies appealed to the discontented social and economic elements in Austria and at one point were actually being supplied by a number of Viennese merchants. The radical Hussite party, the Taborites, directed a series of manifestos at Austria, at least two of which are known to have been translated into German in Vienna itself. But internal strife in the Czech Hussite party brought about the destruction of the Taborites at the battle of Lipany in 1434 and the victorious Utraquists, or Calixtines, were a gentry-dominated party, which was not likely to find, or to seek, much support in Austria. At the request of Duke Albrecht the Council of Basel instituted a religious visitation of the Austrian lands. Although this visitation was conducted with anything but thoroughness and vigor not much is heard of Austrian Hussitism after it. Conditions in Austria had been almost ideal for a revolution, but by and large the revolution failed to take place.

213 pages. \$2.80. Mic 56-2245

## HISTORY, MEDIEVAL

### HERESY IN AUSTRIA IN THE LATER MIDDLE AGES

(Publication No. 16,928)

Paul Peter Bernard, Ph.D.  
University of Colorado, 1955

Supervisor: Professor S. Harrison Thomson

A number of factors made it appear likely, in the first quarter of the fifteenth century, that Czech Hussite doctrines and principles would find a favorable reception in the Lands of the Austrian Crown. The Austrian political scene was far from tranquil in the second half of the fourteenth century. The country was repeatedly on the point of civil war and never far from a state of complete feudal chaos. In addition to the struggle between the magnates and the House of Hapsburg there was, in Vienna at least, an incipient power-struggle between the patriciate and the lower bourgeoisie. There was, furthermore, a long tradition of heresy in Austria. The fourteenth century saw three major outbreaks of heresy: In its first decade, when the heretics were in all probability Cathari: toward its middle, when the unfortunate combination of the great plague and of a severe earthquake provoked all manner of heretical activity; and in its last years, when there was a general outbreak of Waldensianism. The oft adduced objection that Hussitism was too inherently anti-German to take hold in a Germanic country is forcibly met by the circumstance that Hussitism did make inroads into Germany proper, especially in the Rhineland towns. Hussitism did indeed take hold in Austria, being given considerable impetus there by the visit of Hus' friend Jerome of Prague to Vienna in 1410. Jerome was arrested at the order of the Austrian hierarchy and tried for heresy, but managed to escape to Moravia. In the following year a number of Viennese burghers were arrested on suspicion of being

## HISTORY, MODERN

### THE SECRET RUSSO-JAPANESE ALLIANCE OF 1916

(Publication No. 16,272)

Peter Alexander Berton, Ph.D.  
Columbia University, 1956

Principal sources: Japanese and American unpublished archives and Russian diplomatic correspondence. Appendices: 16 drafts or texts of treaties and diplomatic notes, map, rosters.

After the outbreak of World War I Russian Foreign Minister Sazonov proposed Russia's adherence to the Anglo-Japanese Alliance, but Japanese Foreign Minister Katō and British Foreign Secretary Grey, in fear of weakening the Alliance, favored shelving the question until after the war. Japanese Elder Statesmen, however, dreading a postwar "all-white" alliance and Japan's isolation urged conclusion of an alliance with Russia.

Spring 1915 brought Russian military disasters and increased Japanese influence in China ("twenty-one demands"). Sazonov repeatedly proposed alliances to facilitate Japanese munitions delivery and to prevent Japanese-German rapprochement. The Elder Statesmen replaced Katō by Ishii. Ishii favored adherence to the London Declaration (Franco-Russo-British agreement against separate peace) to strengthen Japan's position at the peace conference, to satisfy Russia and to forestall a Russo-German separate peace.

In December 1915 Nicholas II sent a mission to Japan to offer a Manchurian railroad sector in exchange for munitions and an alliance against German postwar re-emergence in China as well as to lessen the possibility of German-Japanese rapprochement. (Previously Sazonov

had failed to obtain Japanese agreement to China's break with the Central Powers.) Ishii rejected the Russian proposals, but the Elder Statesmen forced negotiations.

Japan offered an unlimited offensive-defensive alliance; Russia wanted the alliance within the Entente framework and inserted clauses restricting Japanese action in China. After four months of negotiations in Petrograd, Russia and Japan compromised in signing a public convention and a secret alliance without restrictive clauses, but weakened by dependence on French and British commitments. France and Britain approved this alliance.

The public convention reflecting mutual suspicions contains pledges against joining hostile combinations and an article on defense of special interests (provisions of the secret 1910 agreement extended to the entire Far East), a warning to China, Germany and the United States. The secret agreement was to prevent domination of China by a third power. Both Russia and Japan had Germany in mind and not the United States. Moreover, since the alliance was linked with British and French assistance, its application against the United States was unlikely. Essentially it was an anti-German measure.

By this agreement Russia achieved additional security in Eastern Asia. Since negotiations for cession of the railroad were not completed until the November Revolution, it is doubtful whether the Alliance produced a substantial increase of Japanese supplies. Whether it facilitated China's break with Germany is likewise questionable. Nevertheless the Alliance kept Japan more firmly in the Allied camp. Japan obtained another ally and perhaps easier access to confidential European information. The Alliance was not planned to obtain recognition of newly-won Japanese interests in China nor support of Japan's wartime claims. Whether the Alliance achieved these results is difficult to answer in view of the changed situation produced by the Russian Revolution.

Had Russia not collapsed, it might have supported Japan at Versailles; Russia and Japan might have demarcated their spheres of influence in China--western regions to Russia, coastal to Japan; and had Russo-British friction arisen in the Near East a Russo-Japanese bloc might have developed to balance an Anglo-American coalition. Japan's isolation at the Washington Conference and the return of Shantung might have been avoided.

#### Significance of Alliance:

1. Elder Statesmen's successful interference in foreign affairs shows sources of Japanese political power and their interrelationship.

2. Confluence of Russo-Japanese national interests provides precedent and shows feasibility of cooperation between the two nations, which in turn has significant implications for the foreign policies of the United States and China.

460 pages. \$5.75. Mic 56-2246

#### THE DISARMAMENT MOVEMENT, 1918-1935

(Publication No. 17,041)

Adelphia Dane Bowen, Jr., Ph.D.  
Columbia University, 1956

The Disarmament Movement, 1918-1935 attempts to describe the movement for international disarmament

from 1918 to about 1935 and to survey press opinion and other developments related to the movement. Extensive use was made of the newspapers in the United States, Great Britain, France, Germany, and Italy. The author felt that the molding of public opinion took on added significance during the period between the two World Wars when great use was made of "diplomacy by conference" and an attempt was being made to put into practice the Wilsonian ideal of "open covenants openly arrived at." Attention was fixed especially on the Washington Conference, 1921-1922, the Geneva Naval Conference, 1927, the London Naval Conference, 1930, the World Disarmament Conference, 1932-1934, and the Second London Naval Conference, 1935-1936. The sessions of the Preparatory Commission for the World Disarmament Conference, 1926-1930, and important measures related to disarmament, such as the Geneva Protocol of 1924, were also considered.

The author concludes that of the major powers only the United States and Great Britain wholeheartedly supported disarmament, and that this was due primarily to their insular positions and secondarily to their democratic institutions. And even in the case of Great Britain, especially when controlled by the Conservatives, the government was more interested in the "limitation" than the "reduction" aspects of disarmament because it wished to preserve British security while at the same time avoiding the financial strain of competing in new and more expensive types of weapons. It was largely American efforts that kept the movement going. Woodrow Wilson inspired it; Harding, under the pressure of public opinion, convened the Washington Conference of 1921; Coolidge called the Geneva Naval Conference of 1927; the concessions of the Americans broke the ice before the Preparatory Commission in 1929; and the London Naval Conference of 1930 was only made possible by American concessions to British demands for more light cruisers. At the World Disarmament Conference the United States alone among the major powers was able to convince the rest of the delegates that it was willing to go so far as to reduce all armaments by one-third.

The main obstacle to disarmament was the French concern for security and unwillingness to agree to an equalization of armaments with Germany so long as greater assurances of security were not extended to France. The conclusion is reached that the failure of disarmament, which had most of the propaganda on its side, may well have been a failure in leadership because the British people seemed willing to accept both greater guarantees to France and more concessions in the way of disarmament and collective security than the British statesmen ever proposed. If Great Britain and France had been able to work more closely together, they could probably have solved the disarmament and security problem without holding Germany permanently in an inferior position. As it was, they fell between two stools, neither placing sufficient restrictions on Germany to prevent her rearmament nor extending enough concessions to her to make her feel a partner and an equal in the disarmament endeavor.

The author feels that, although the disarmament movement failed, it was not without its significance in history, because it contributed to such things as the "merchants of death" theme, the American neutrality legislation of the 1930's, the nationalization of the armament industry in

France, and generally to a weakening of resistance to the Fascist dictators. 402 pages. \$5.15. Mic 56-2247

**CHURCH AND SOCIETY: A STUDY OF  
THE RELIGIOUS OUTLOOK OF  
ALEXIS DE TOCQUEVILLE**

(Publication No. 16,950)

Doris Silk Goldstein, Ph.D.  
Bryn Mawr College, 1955

Within the last two decades there has been increased scholarly interest in Alexis de Tocqueville, the author of La Démocratie en Amérique and L'Ancien Régime et la Révolution. The new works which have appeared have touched upon the importance of religious factors in Tocqueville's thought, but there has been no detailed historical research on this problem.

This study attempts to clarify Tocqueville's fundamental religious beliefs. Tocqueville's nature was essentially spiritual and religious, and he adhered to the basic postulates of Christianity. At the age of sixteen he lost the firm Catholic faith traditional to his family, and did not regain it, except perhaps during the last weeks of his life.

Tocqueville believed that religious faith was necessary to human beings, and he carried this idea over into his social philosophy. In the Démocratie he emphasized that only religion could provide the moral stability without which modern democracies would tend to fall into anarchy, and ultimately despotism. The strength of religion in America enabled it to fulfill this mission, Tocqueville concluded, and to become a bulwark of liberty and order. Willingness to adjust to the conditions of democratic society, and particularly to accept the principle of separation of church and state, accounts for the strength of the American sects.

Tocqueville entered French political life in 1840 with the aim of fostering the alliance of liberty and religion that had proved so fruitful in America. The French liberal Catholic movement, born in 1830 through the inspiration of the Abbé Lamennais, also emphasized the desirability of joining the French Catholic Church to the new forces of liberty and democracy, and saw the separation of Church and State as an important means to this end. Comparison of Tocqueville's attitude towards French religious issues during the forties and fifties with that of the liberal Catholics makes it clear, however, that the Catholic party, unlike Tocqueville, was forced to compromise with its liberal principles because of papal and episcopal disapproval.

Tocqueville took no part in the Catholic campaign of the forties to destroy the University monopoly of secondary teaching, for he realized that the aim of even the liberal Catholics was not freedom of teaching but a preponderance of influence in education. In the Roman affair of 1848-1849 Tocqueville entered into temporary alliance with the Catholic group, but the aims of the two differed: Tocqueville called for liberal institutions for the Papal States, while the Catholics were concerned only with the restoration of Pius IX. Tocqueville steadfastly opposed the Caesarism of Louis-Napoleon because of his liberal

principles, while in general the opposition of the liberal Catholics was based on dissatisfaction with the religious policy of the regime.

In the Ancien Régime, Tocqueville's last great work, there is the same preoccupation with the separation of church and state, and with the alliance of liberty and religion, that was apparent in the Démocratie. In the later book, however, Tocqueville describes the obverse of the American situation: how irreligion became prevalent in France, and gave rise to a spirit of anarchy, because French Catholicism was associated with outmoded feudal institutions.

The general conclusion arrived at by this study is that Tocqueville should be ranked among those nineteenth and twentieth century theorists who, from a liberal point of view, discussed the problems confronting religion and the church in modern society.

187 pages. \$2.45. Mic 56-2248

**STAGECOACH AND MAIL FROM  
COLONIAL DAYS TO 1820**

(Publication No. 17,059)

Oliver Wendell Holmes, Ph.D.  
Columbia University, 1956

Conditions in the colonies were not conducive to the development of stagecoach lines until after the French and Indian War. Progress was rapid in the next 12 years, although the enterprises were primitive in character and limited to lines (1) across the waist of New Jersey between New York and Philadelphia (2) across the neck of the Delaware-Maryland peninsula between Philadelphia and Annapolis or Baltimore (3) from Boston to Providence or Newport on the route to New York, and (4) to local lines radiating out from the three hub cities of Boston, New York, and Philadelphia. Service on all lines was suspended during the Revolution when these same three cities were captured and held by the British.

The colonial lines were quickly revived and extended after the Revolution, partly by pre-Revolutionary proprietors and partly by young Revolutionary express-riders or wagon-masters who brought new energy to the business. Levi Pease, "Father of New England Stagecoaching," organized the first Boston-New York line (1783); and Nathaniel Twining and John Hoomes, pioneer stagers in the South, established lines southward from Baltimore to Petersburg and Norfolk, Virginia (1784). Stagecoaching facilities were becoming appreciated and relied upon by mercantile interests and a growing travelling public. New lines were encouraged in some states, notably New York, Maryland, and Virginia, by legislative grants of monopoly rights on certain roads for a term of years. Still greater encouragement came when Congress, in 1785, voted to employ the states, on routes where established, to carry the public mails. This move gave them a quasi-public character as an arm of the General Postoffice, and their success and expansion became the concern of many citizens who had not hitherto used their services. Until the invention of the telegraph, the progress of news, public and private, was geared to the movements of the stages on the main roads of America.

The expansion of lines and increases in service, chronologically and geographically, are traced north into Maine and New Hampshire and the Connecticut Valley and Lake Champlain regions, west along the Mohawk and Genesee Road to the Niagara frontier and over the Appalachian ridges to Pittsburgh. A major achievement was the establishment of a permanent stage line from Virginia to Charleston, South Carolina, in 1803, which connected with lines already existing between Charleston and Savannah and Augusta, Georgia. This had been encouraged by extra financial support from the Postoffice, as were also lines to give faster, surer communication between East and West, down the Great Valley, in 1807, to Knoxville and Nashville, Tennessee, and across Zane's Trace in Ohio and the Maysville Road in Kentucky, in 1809, to Lexington and Frankfort. Additional lines west of the mountains were established slowly because of the War of 1812, but in 1820 the line to Kentucky, extended westward through Louisville and Vincennes, reached the Mississippi at St. Louis.

Meanwhile, networks of stage lines in the older regions became more complicated, and facilities and accommodations better. The construction of turnpikes lifted the stages out of the mud and permitted night travel. The Postoffice pressed for ever greater speed, and "accommodation" lines were established in greater numbers to care for local needs and for passengers who preferred more leisurely travel. Competition between rival lines resulted at first in bitter wars to drive each other off the road, but there came a time on the busier routes when the amount of travel was sufficient to allow competing interests to exist. The steamboats drove the stages off the roads where there were parallel waterways, but, after an initial period of rivalry, the stage lines were rearranged to act as feeders. Both became necessary to each other, as complementary facilities, and travel increased rapidly enough after the War of 1812 to make both profitable.

The shortcomings of the stagecoach as a carrier of the public mails were painfully evident to early Postmasters General, and all of them had periods of discouragement, but a system of riders could never have met the nation's increasing demands. The generous policy of the Government toward newspapers -- low rates and free printers' exchanges -- which meant much to American education and democracy, would not have been possible without the use of the stagecoaches. The supervision of the mail stage network to make of hundreds of privately organized enterprises a coordinated and integrated system so far as the transportation of the mails was concerned, was one of the unrecognized administrative triumphs of our early government. The establishment and profitable operation of a government-owned line between Baltimore and Philadelphia for many years served as an example to recalcitrant contractors. By 1820 the staging business had reached maturity in the older regions and seemed destined to serve the country indefinitely, the railroad as yet not being in existence even as a meaningful concept.

308 pages. \$3.95. Mic 56-2249

#### THE WHITE CITY: THE WORLD'S COLUMBIAN EXPOSITION OF 1893

(Publication No. 17,062)

Robert Knutson, Ph.D.  
Columbia University, 1956

Held to commemorate the four hundredth anniversary of the discovery of America, the World's Columbian Exposition was awarded to Chicago after a spirited contest with New York. The lagoons and canals, which the public thought were so beautiful, were planned by landscape architect Frederick Law Olmsted, his partner, and the Chicago architect John Root. Another Chicago architect, Daniel Burnham, was Chief of Construction and he enthusiastically approved a classic design for the main Exposition buildings. Although Chicago had developed an architectural style of its own New York architects swayed him to adopt the classic. The combination of the great white Greek temples and the beautifully landscaped grounds so impressed artistically immature Americans that the Exposition stimulated a classic revival in architecture. This result has often been criticized, especially by Louis Sullivan and his followers, but a good case can be made in favor of the unified design. The beautiful ensemble of buildings and landscaping also inspired the birth of city planning in America.

In paintings the majority of people appreciated those which told a story. Many French impressionist pictures were displayed, not by France but by American collectors. (Impressionists were not this well represented in contemporary French expositions.) The extensive use of statuary and murals on exhibit buildings was a pleasant surprise to people and they now realized that to produce a complete and perfect whole these arts should be allied with architecture.

Of the exhibits the most spectacular was the lighting of the Exposition. For the first time in the United States alternating current was publicly used instead of direct current, an occasion of great significance in the lighting industry. An electric elevated railway which traversed the grounds was the first heavy high speed train to use electricity and the experiment was an incentive to adopt this source of power on railways. The steam railroad was the most common conveyance in the United States at this time, and it was an amazed populace that saw horseless carriages in the Transportation Building. Both Americans and foreigners inspected new fruits in the Horticulture Building, and California and Oregon displays stimulated the industry in those states. In Machinery Hall the Yale University student Lee de Forest, later called "The Father of Radio," educated himself while working as a chairpusher.

The great number of exhibits in Agricultural Hall inspired a national study of the chemical composition of foods, their nutritive values, and the dietary needs of people. Exhibits in the Forestry Building, including one that was managed by Gifford Pinchot, gave people a new appreciation of forest management. And special exploratory expeditions for the Anthropological Department uncovered much new material and awakened a widespread interest in the subject.

In addition to the expected exhibits twenty World's Congresses were held throughout the summer. Frederick Jackson Turner, in the Literature Congress, read a paper

on "The Significance of the Frontier in American History." The Congress of Representative Women made many converts for equal suffrage, and new religious philosophies were founded in the United States as a result of the Parliament of Religions.

The fair was a financial loss to its stockholders but both Chicago and the nation profited by it. It increased foreign trade; it was a university of learning for Americans; it improved their taste for beauty and the arts; and, on the Midway Plaisance, it gave them a thoroughly enjoyable time.

These are but a few consequences for which the White City is remembered today. In 1893, however, it was a national celebration of which all America was proud. The nation was exhibiting itself to the world and boasting of material and cultural progress she had made. For Chicago it served to demonstrate her growth and maturity. And for the average American the Exposition was a unique and exciting experience from which he learned a great deal and fondly remembered for the rest of his life.

295 pages. \$3.80. Mic 56-2250

#### NAVIGATIONAL PROBLEMS AT THE MOUTH OF THE MISSISSIPPI RIVER, 1698-1880

(Publication No. 17,104)

Walter McGehee Lowrey, Ph.D.  
Vanderbilt University, 1956

Supervisor: Professor Herbert Weaver

When the French made their first settlement in Louisiana in 1699, they chose a spot on the unfertile shore near Biloxi rather than a location on the banks of the Mississippi River. A major reason for the unhappy choice was that at some seasons the entrances to the river were blocked by mud bars to all ships drawing over twelve feet of water. These bars, typical of obstacles found at river mouths all over the world, remained an exasperating and, at times, an almost overpowering hindrance to the development of the commercial possibilities of the Mississippi Valley for almost 200 years.

Bars are always found at the mouth of a delta-forming river like the Mississippi. For numerous reasons the current of such a river slows as it nears the sea, and this slowing causes the river to deposit its silt content, forming underwater barriers of mud in each of its passes to the sea. Those of the Mississippi passes averaged at least two miles in width, with only twelve feet of water over them. With the exception of this two-mile section of each pass, the river was sufficiently deep at all times for any vessel to navigate as far up as New Orleans. This dissertation is a study of the effect of these bars on commerce, and of the long and difficult search for a method to improve navigation at the mouth of the Mississippi River.

From the days of the first French settlement in Louisiana, inhabitants, merchants, and the governments controlling the river mouth devoted an enormous amount of time, thought, and money to a search for a practicable way to deepen the channels over the bars in order to make New Orleans accessible to large ships. The French har-

rowed the bars to stir up silt so that it would be swept out to sea, attempted to dig a channel through the bar, and proposed narrowing one of the passes with "jetties" to increase the speed of its current so that it would sweep itself out. The French schemes came to naught and the Spanish philosophically accepted the shallow river entrances.

Under United States control, the problem was turned over to the Corps of Engineers. After its expensive attempt to dredge a deep channel failed in 1838, Congress made no further appropriations until the decade of the 1850's, during which the Engineers let several contracts to private companies to secure an eighteen-foot channel. Harrowing, dredging, blasting, and experimental jetties were all tried unsuccessfully before the Civil War halted work.

As ships grew larger and commerce declined alarmingly following the Civil War the Government tried new, expensive propeller dredges in the passes with little success. The entire Mississippi Valley, disgusted with continuing failure, demanded that the Engineers find a permanent solution to the problem. The Engineers finally settled on a plan to construct a twenty-five-foot deep canal just below Fort St. Philip to connect the river with Breton Island Sound.

General John G. Barnard, Corps of Engineers, defied the array of Corps officialdom as well as virtually the entire populace of New Orleans who supported the canal to insist in 1874 that jetties such as those used successfully on the Danube be given an adequate trial before resorting to the canal. Because of his arguments, and because James B. Eads, St. Louis engineer, proposed to construct jetties at a cost one-half that estimated for the canal and to guarantee their success, Congress, under the leadership of Senator William Windom of Minnesota, and in defiance of the Corps of Engineers, pushed through a bill in March, 1875, to allow Eads to jetty South Pass, never before used and with a depth of only eight feet on its bar. Eads promised to develop a thirty-foot channel for \$5,250,000 and to maintain it for twenty years at \$100,000 per year. If his jetties failed, Eads would not be paid.

Financial difficulties, combined with the adamant opposition of General Andrew A. Humphreys, Chief of Engineers, hindered construction progress, but Congress voted modifications of channel dimensions and pay clauses of the contract which enabled Eads to complete the jetties in 1879. They still stand, and still produce a channel thirty feet deep. Through them, the produce of the Mississippi Valley achieved a cheaper, easier access to Eastern and world markets.

494 pages. \$6.30. Mic 56-2251

#### THE ROLE OF NEW YORK IN PRIVATEERING DOWN TO 1763

(Publication No. 17,068)

James Gavin Lydon, Ph.D.  
Columbia University, 1956

During the sixteenth and seventeenth centuries piracy became widespread in the Indian Ocean and the Caribbean Sea. By 1690 the buccaneers had spread their influence into North America as well and it became obvious that the

pirates must be suppressed and the privateersmen controlled. Strict enforcement of the existing laws by British colonial governors and supplementary legislation soon indicated that their excesses could be halted. By the close of Queen Anne's War in 1713 the new laws had reached out to circumscribe more and more fully the activities of those who lived their lives upon the sea. The privateersman-pirate of the earlier period disappeared and his counterpart of the later era found himself almost completely under the control of the government which issued his commission. One of the aims of this study is to indicate how these new laws effected a change in the attitude and activities of New York's privateersmen.

In spite of these changes the destruction of enemy shipping remained at least as profitable as it had been previously. The British government attempted by various changes in the prize laws to make privateering more attractive. The support of the raiders was needed during time of war for their attacks on enemy commerce offered the government an opportunity to injure the enemy at little or no expense. With the growth of the new system the most reputable businessmen turned to privateering for the rapid profits it promised. A new type of privateersman made his appearance, one who combined his desires for gold and glory with some religious and patriotic fervor. Privateering, after 1740, reached the level of a highly speculative business. It cannot be denied that, on occasion, piratical attacks were committed by privateersmen. Several of New York's raiders were among those who crossed the now well-defined line between privateering and piracy. However, on the whole such incidents were rare and almost always brought swift retribution by the authorities.

Between 1739 and 1763 New York and Rhode Island were the leading privateering centers in North America. During King George's War New York sent thirty-five raiders to sea, compared to forty fitted out by the Rhode Islanders. When war broke out again in 1756 the Yorkers outfitted more than twice as many privateers, employing, at various times, a total of four thousand mariners. New York surpassed all of the other North American colonies in the size of her sea force. In the course of the last two intercolonial conflicts New York's raiders captured shipping valued at more than two million pounds, a staggering sum. The colony held a position equal to that of all New England as a privateering center before the Revolution.

References to earlier privateersmen from New York are scarce but enough material remains to indicate the change in their activities in comparison with the later wars. New York had her corrupt governors and roistering pirate-privateersmen. Her records show their disappearance under the combined attacks of law and naval squadron. Especially in the latter two wars does the business of destroying French and Spanish commerce admit

close inspection. New York, indeed, offers a unique opportunity for a study of the part played by the privateersmen of colonial America. The burden of this volume is to indicate their contributions militarily, economically and legally in the history of privateering from New York prior to 1763.

394 pages. \$5.05. Mic 56-2252

**DAVID ZEISBERGER'S OFFICIAL DIARY,  
FAIRFIELD, 1791-1795**

(Publication No. 17,070)

Paul Eugene Mueller, Ph.D.  
Columbia University, 1956

This is a translation from the German of David Zeisberger's Fairfield Diary, which is preserved at the Bethlehem Moravian Archives. Zeisberger was the Senior Missionary among the American Indians for the Unitas Fratrum or Moravian Church. The Introduction to this thesis presents a summary of the history of the Church and its mission activity from the first half of the eighteenth century into the second half of the nineteenth and includes the general historical background of the period, as the land-hungry colonists clashed with the Indians and the British in the Northwest Territory. It traces the westward course through the wilderness the missionaries were forced to take as they moved their mission towns of Indian converts through Pennsylvania into Ohio, where they enjoyed their most flourishing period before and during the Revolution, when Zeisberger wielded a strong influence at the councils of the Delaware Tribe. Because of the Revolution, the Christian Indians were abducted by warriors of their own race under British domination and, after many hardships, were reassembled in Michigan.

This portion of Zeisberger's Diary opens when the mission Indians were waiting at the mouth of the Detroit River, after having lived for a time on the south side of Lake Erie, for permission from the British Government to move to a more permanent location. In 1792, they established Fairfield on the Thames River. This settlement was destroyed by the invading Americans in 1813, but rebuilt across the river and called New Fairfield. The reservation still exists and is known as Moravian Town.

Fairfield was located on the land route between Niagara and Detroit. Many people, Indians and whites, passed through the town, and the diarist records current events as well as purely mission matters. These have been annotated in detail. This translated portion of the Diary covers many events, including the Battle of Fallen Timbers, and ends just prior to the signing of the Treaty of Greenville in 1795.

314 pages. \$4.05. Mic 56-2253

## HOME ECONOMICS

### THE ABSORPTION OF IRON FROM BREAD ENRICHED WITH REDUCED IRON BY NINE YOUNG WOMEN, AND THE INFLUENCE OF THE MENSTRUAL CYCLE UPON ABSORPTION

(Publication No. 17,001)

Anna-Elisabeth Hoene, Ph.D.  
Cornell University, 1956

The enrichment of bread and other cereal products with iron is of nutritional value only if an iron compound is used which can be efficiently absorbed and utilized by the human organism. The iron preparation employed in larger amounts than any other for the enrichment of flour is reduced iron, a finely powdered metallic iron also called "ferrum reductum". The purpose of the research reported here was to measure the percentage of iron absorbed by human subjects from bread which was baked from flour doubly enriched with reduced iron.

Nine young women from 22 to 36 years of age were served a constant basal diet which consisted of a variety of common foods and met the N.R.C. allowances for all nutrients except for iron. During the control period which lasted for 28 days unenriched bread was served with all three meals and the daily intake of iron was 5.46 mg. During the following 28 days bread enriched with 7.63 mg. of reduced iron per day was served, and the total daily iron intake was 13.07 mg.

The mean fecal excretion of iron for all nine subjects was 4.50 and 11.96 mg. per day for the control and experimental period, respectively. The values for fecal iron excretion for each subject varied considerably from time to time. Apparently other factors were of more importance in altering the fecal iron values than the addition of the enriching iron.

The amount of iron absorbed from reduced iron used in the enrichment of bread was calculated by subtracting the increase in fecal iron during the experimental period over that during the control period from the increase in iron intake due to the enrichment of bread with reduced iron. The mean absorption of reduced iron by the nine subjects was 0.17 mg. per day or 2.2 per cent. Two subjects absorbed considerably more iron than the other subjects and raised the mean to some extent. The other seven subjects absorbed none or so small an amount of iron as to be negligible.

When the mean fecal iron excretion for the collection periods coinciding with the menstrual periods of each subject were compared with those of the non-menstrual periods it was found that eight out of nine subjects showed increases during menstruation. In three cases the increase was statistically significant at the five per cent level. Similar comparisons were made for fecal dry-weight and showed an increased fecal dry-weight during menstruation in seven out of nine subjects. An analysis of covariance of the effect of menstruation on fecal iron excretion using fecal dry-weight as a covariate showed,

however, that the increase in fecal iron during menstruation was mainly due to the corresponding increase in fecal dry-weight.

Apparently for some women menstruation has an effect on the loss of iron in the feces. For this reason a complete menstrual cycle should ideally be included in every treatment period on similar iron balance studies.

47 pages. \$1.50. Mic 56-2254

### FAMILY RELATIONS AND SOCIAL ADJUSTMENT SCORES ON THE MINNESOTA PERSONALITY SCALE AS RELATED TO HOME AND SCHOOL BACKGROUNDS OF A SELECTED GROUP OF FRESHMAN WOMEN

(Publication No. 17,027)

Bernadine Johnson, Ph.D.  
The Florida State University, 1956

The purpose of the study was to explore the relation of scores of college students on the family relations and social adjustment sections of the Minnesota Personality Scale to certain factors of family background, high school experience, and performance during the first year in college. Differences were determined between the proportions of students having satisfactory scores and those having extreme scores in relation to (1) size of home community, (2) church membership, (3) marital status of parents, (4) occupational status of parents, (5) education of parents, (6) size of high school attended, (7) participation in extra-curricular activities in high school, (9) grade-point average for the first year in college, and (10) the amount of time spent in college.

Subjects were 317 freshman women entering The Florida State University, Fall semester, 1953-54, chosen randomly from all those who (1) lived on campus, (2) were single, (3) were full-time students, (4) were sixteen to twenty years old, (5) had been graduated from high school in the Spring of 1953, and (6) had non-confidential records.

Information concerning family and high school background and college performance was obtained for each subject from the Office of Personnel Records.

Subjects were divided into groups according to their scores on the family relations and the social adjustment sections of the Minnesota Personality Scale. Satisfactory scores were considered as those from 15 to 85 inclusive; unsatisfactory scores were considered as those from 01 to 10 and from 90 to 99 inclusive. The statistical significance of the difference in the proportions of subjects in each group, satisfactory and unsatisfactory, in relation to specific factors, was tested and the level of significance determined.

Statistically significant differences were found between proportions of subjects with satisfactory and unsatisfactory scores on the family relations section of the instrument in relation to (1) church membership (more subjects with satisfactory scores were members of a church); (2) marital status of parents (more with unsatisfactory scores came from unbroken homes); (3) occupation of parents (more with unsatisfactory scores had fathers in professional and managerial occupations); (4) education of parents (more subjects with satisfactory scores had mothers who had not attended college; and, conversely, more with unsatisfactory scores had mothers who had attended college); (5) size of high school (more with unsatisfactory scores had attended high schools with an average daily attendance over 2,000, while more with satisfactory scores had attended high schools of 1,000 to 1,500); (6) average high school grade (more subjects with satisfactory scores had an average of A and A-; also, more with unsatisfactory scores had averages below C); (7) grade-point average for the first year in college (more subjects with satisfactory scores had averages of B and above).

Statistically significant differences were found between proportions of subjects with satisfactory and unsatisfactory Social Adjustment scores in relation to (1) occupation of parents (more with unsatisfactory scores had fathers in professional and managerial occupations; also, more with unsatisfactory scores had one parent who was a teacher); (2) size of high school (more subjects with satisfactory scores had attended either a very large or a small high school, while more with unsatisfactory scores had attended medium-sized schools); (3) average high school grade (more with satisfactory scores had averages of B and above and more with unsatisfactory scores had averages of C and below); (4) extra-curricular activities in high school (more subjects with satisfactory scores had participated in five or six activities while more of those with unsatisfactory scores had participated in more or fewer); (5) time spent in college (more with satisfactory scores remained in college less than two semesters).

73 pages. \$1.50. Mic 56-2255

#### AN EXPLORATORY STUDY OF VALUES AND PRACTICES IN CHILD-REARING AMONG URBAN LABORING CLASS FAMILIES IN PUERTO RICO

(Publication No. 15,504)

Rosa Luisa Stefani, Ph.D.  
Cornell University, 1955

This was an exploratory study of the values and practices in the guidance of 75 mothers from Puerto Rico urban laboring class families.

The purposes were: 1) to find out to what extent the mother-child relationships in guidance approached the "democratic way of living", and 2) to discover if through their guidance mothers were helping their preschool children achieve their major "developmental tasks."

Seventy-five families were drawn from three different subgroups in the hope that the investigation might yield insight as to the relationships, if any, of the guidance offered by the mothers with the length of the period of residence in a public housing project. All the families had

lived a minimum of five years in a slum prior to the beginning of this investigation; a third were still living there or had moved only a few months before they were interviewed; a third had been living in a public housing project for a period of one to two years; and a third had been living in a public housing project for at least five years.

The interview method was used in collecting the data. The interview guide was built around eight selected situations in child-rearing that were significant to the everyday life of preschool children in Puerto Rico and would elicit responses reflecting values and practices of the mothers in their guidance of the children.

The measure for values was a five degree rating scale for twelve value concepts in "democratic living" adapted from the study of the acculturation of Canadian-Japanese by Margaret L. Hockin.

The measure for "developmental tasks" was the Tryon and Lilienthal organization of the tasks for early childhood as extended by the 1952 Seminar in Child Guidance at Cornell University.

In terms of method the outcomes were:

1. A method for defining value concepts in mother-child relationships in operational terms that represented differences in degree of the values.

2. A method for classifying mothers' guidance with reference to a basic descriptive pattern of the truest-to-type democratic mother.

3. A method of organizing guidance data in the form of composite descriptions to facilitate the analysis of such data in terms of values and of "developmental tasks."

In terms of content the outcomes were:

1. An accumulation of guidance data for the values in democratic living.

2. Representative and composite descriptions of guidance of the three main positions, "balance", "little of", "much of", for the value control.

3. Distribution of mothers by their degree of control.

4. Variations in control in the eight situations and the five steps in guidance.

5. Interpretive summaries for the other eleven values and the "developmental tasks" for early childhood.

The following conclusions were drawn:

Nearly three-fourths (73.3%) of all the mothers were in the "balance" position or indicated a strong tendency toward it in their guidance. All of the values, in addition to control, significant in "democratic living" were operating to some extent in the overall guidance of this group of mothers. The values of activity, freedom, participation, and security appeared to be the most significantly involved. These mothers were also helping their preschool children achieve their major "developmental tasks" through their "democratically" oriented guidance.

The remaining fourth (26.7%) of the mothers were at one of the two extreme deviant positions.

There was some indication that living under the conditions offered by public housing projects influenced favorably the quality of the guidance of mothers. Although the effects were slight, the tendency was consistent with the increase in the number of years of residence in a housing project.

222 pages. \$2.78. Mic 56-2256

## LANGUAGE AND LITERATURE

### LANGUAGE AND LITERATURE, GENERAL

#### THE PRODUCTION OF SHAKESPEARE'S PLAYS AT THE GLOBE PLAYHOUSE, 1599-1609

(Publication No. 17,039)

Bernard Beckerman, Ph.D.  
Columbia University, 1956

The decade (1599-1609) when the Globe was the only playhouse in which the Lord Chamberlain's-King's men publicly performed warrants individual attention. To reconstruct the Globe company's style of production it is necessary to examine its repertory system, dramaturgy, stage, acting, and staging.

The repertory system of the public playhouses was irregular in detail but regular in overall pattern. A company usually performed a new play several times the first month and then repeated it with diminishing frequency. Ten performances were average. About seventeen new plays were presented each year, and most plays presented were less than a year old. Usually the performances were orientated towards the public playhouses rather than the court. Of the original Globe repertory of 1599-1609 fifteen plays by Shakespeare and fourteen by others are extant.

Elizabethan dramatic structure, hitherto oversimplified or neglected, provides significant evidence for the study of Elizabethan staging. To understand the structure it is necessary to revise one's concepts of unity, cause and effect, and climax. Fundamentally, the Elizabethan play was organized to tell a story. The Globe finales show the working out of the narrative through the passing of judgment and/or granting of mercy or love in one of several recurrent manners. The narrative patterns leading to the finales were either episodic, 'river' or 'mirror,' in structure. The 'climax' which fell in the center of the play was not a point but a 'plateau,' an extended sequence of intense moments involving emotional release. The multiple unity of the play was the function of structure, character, language and theme.

The form of the stage required by the Globe plays satisfied the Elizabethan concepts of scene localization and theater design. Shakespearean Globe scenes were either unlocated, located, or general, mainly the last. The design of the stage was Renaissance and conventional rather than Tudor and realistic. The platform was rectangular; the stage doors, flush with the rear wall. The inner stage, used infrequently in the Globe plays, served mainly to discover a few people in striking poses. It was not employed primarily to set properties, for a thorough examination of Globe properties reveals that the majority were carried on stage. The upper stage was used only in conjunction with action on the main stage. Only about twenty percent of the scenes require any particular physical facility whatsoever.

The acting style at the Globe must be considered in

light of five factors. First, Tudor rhetoric did not systematize methods of delivery but did emphasize grace of expression, stimulation of emotion, and proper rendition of the figures of speech. Secondly, the theatrical tradition gave the actor experience in doubling, in playing generic types, and in projecting stock emotions. Thirdly, playing conditions threw the burden of rehearsal upon the actor. Fourthly, the Elizabethans believed that man's motives, largely taken for granted, were general rather than specific, and that passions of all sorts threatened to break through the ceremonious decorum of social behavior. Lastly, the Globe plays reveal that the individualizing element in the drama was primarily the realistic portrayal of emotion and secondarily the display of wit. Therefore, the actor combined formal, generalized patterns of behavior with natural, individualized expressions of emotion.

Staging at the Globe was a function of the play more than of the stage. Spatial illusion was conventional and non-realistic. Stage grouping was ceremonious. Scene continuity was inherent in the play and did not depend upon playing successive scenes in different stage areas. Recurrent types of scenes in the Globe plays show similar methods of staging. This practice is well illustrated in the ceremonious staging of the finales. Altogether production at the Globe playhouse exhibits a style which is at once ceremonious, romantic, and epic.

468 pages. \$5.95. Mic 56-2257

#### STRUCTURAL AND LEXICAL DISTRIBUTIONS OF FUNCTION WORDS WITH SUBSTANTIVES IN THE PASTON LETTERS (1440-1460)

(Publication No. 17,423)

Seymour Benjamin Chatman, Ph.D.  
University of Michigan, 1956

This dissertation is a description of the use of function words with substantives (prepositions) in a select corpus of Late Middle English (1440-1460). The purpose of the analysis is to provide a set of statistics for Late Middle English comparable to Professor C. C. Fries' tables in his monumental American English Grammar (Chapter VII).

Chapter I is an extensive review of previous treatments of function words with substantives and particularly of recent structuralist analyses. After describing and defending the use of the Paston Letters as a corpus representative of colloquial Middle English, a theory of analysis is presented in Chapter II. This theory carefully distinguishes between structural and lexical features of function words with substantives. It is suggested that these features are best described statistically, in terms of distributions. Recognizing that the major structural function of such function words and phrases is one of modification, the structural distributions are presented in

terms of the relative position of the word and phrase. Positions are either significant or non-significant: significant position means that the phrase cannot occur in another position in the utterance and continue to modify the same head (e.g., The man from Toledo came here); while non-significant position means that the phrase can occur in other positions (The man came from Toledo here; From Toledo, the man came here; The man came here from Toledo, etc.). The various relevant positions are assigned code letters and tabulations are made of their various frequencies (e.g., the non-significant position before both subject and predicate, modifying the predicate is called 2b: From Toledo, the man came here). Lexical distributions are less amenable to analysis because adequate techniques have not yet been worked out. Two admittedly crude techniques are used: 1. phrases as responses to question words ('What?' 'Whom?' 'Where?' etc.), and 2. "lexical clusters" (lists of heads and axes of function words). It must be pointed out that lexical distribution is not semantic analysis nor is it lexicography, since the purpose is not to define the function words, but to demonstrate the lexical items with which they associate. In this sense, the present dissertation does not compete with the dictionaries, but rather attempts to supplement them with a statement of the frequency, within a given corpus, of some of the various lexical equivalences listed in the dictionaries.

In addition, since it was felt that diachronic implications would be unavoidable, the structural and lexical distributions of function words and phrases were surveyed for obsolescence in terms of the response of speakers of Modern American English. Two kinds of obsolescence are distinguishable: structural (the occurrence of a function word in a position no longer possible) and lexical (the occurrence of a function word as a response or in a lexical cluster no longer possible).

The following function words--the total variety of such words found in the corpus--are analyzed in Chapter III in terms of the four categories, Structural Distribution, Structural Obsolescence, Lexical Distribution, and Lexical Obsolescence: about, above, according to, afore, after, again, against, among, amonges, as, as for, as of, as on, as to, at, awixt, because of, before, behind, beside, between, betwixt, beyond, but, by, concerning, contrary to, due unto, during, ere, except, for, for by, for to, fro, from, in, into, like, near, next, nigh, of, on, out of, over, save, saving, sith, sithen, syn, through, throughout, till, to, to for, touching, as touching, toward, under, underneath, until, unto, upon, versus, with, within, without.

The conclusions of Chapter IV are given in the following tables: Table I. Comparative Table of Function-Word Frequency for Late Middle English and Modern English (Fries' statistics); Table II. Structural Distribution (noun modifiers, 26.54%; verbs, 66.95%; adjectives, 1.99%; adverbs, .49%; verbids, 3.61%; other, .50%); Table III. Total Structural Obsolescence: 3.9%; Table IV. Lexical Distribution ('Where?' 17.33%; 'When?' 8.87%; 'Whom?' 33.13%; 'What?' 35.22%; 'How Much?' 1.17%; 'How?' 3.09%; oaths, .93%, etc.); Table V. Lexical Obsolescence: 14.6%. 271 pages. \$3.50. Mic 56-2258

### THE PRE-RAPHAELITES AND THEIR CRITICS: A TENTATIVE APPROACH TOWARD THE AESTHETIC OF PRE-RAPHAELITISM

(Publication No. 16,971)

William Evan Fredeman, Ph.D.  
The University of Oklahoma, 1956

Supervisor: Dr. A. M. Saunders

Although it included Dante Gabriel Rossetti, Christina Rossetti, John Ruskin, and William Morris, the Pre-Raphaelite Movement has not been adequately considered by literary historians and critics. A Victorian manifestation of Romanticism, the movement occupies a position midway between High Victorianism and the Decadence. With its roots in the reaction against the materialism of the Industrial Revolution, it reasserted the values of individuality in an age of economic laissez-faire. It was a revolt against the academicians in favor of a reassertion of faith in the creative expression of the individual artist. It emphasized the artist as a creator who should follow nature by reproducing what he saw instead of what he was supposed to see. The Pre-Raphaelites were both realists and idealists, and their "Medievalism" was a part of their revolt. As a whole they advocated aesthetic rather than moral or social reform.

Definitions of Pre-Raphaelitism are frequently inconsistent or too limited in scope. The movement, both historical and aesthetic, consists of two distinct phases: the literary and artistic activities of the seven members of the original Brotherhood and the elaboration of the Brotherhood into a movement between 1853 and 1882, which includes the Oxford group revolving about Rossetti, Morris, and Burne-Jones. The latter group held that the artist should maintain a fidelity to the truth of his own inner experience.

A synonymous use of Pre-Raphaelite Brotherhood and Pre-Raphaelite Movement is inaccurate. They are not mutually inclusive but sequential terms. The term Pre-Raphaelitism is generic when it is used to refer to the characteristics of the movement rather than to the movement itself. Begun as a reform in English painting, Pre-Raphaelitism embraces the aesthetics of both literature and art. Even Pre-Raphaelite painting is essentially "literary"; and Pre-Raphaelite poetry is pictorial. The experience of the artist in the creative process is essentially a poetic experience.

The primary influence of the Pre-Raphaelite Movement was literary, although in painting it produced many technical improvements in the use of color, lighting, texture, and the rendering of detail. Its continued influence on the history of 19th century aesthetics lay in its stress on the individuality of the artist and his role in society. Pre-Raphaelitism represents a middle ground between the extremes of Victorian art morality and art for art's sake. The Pre-Raphaelites were unsophisticated advocates of aesthetic reform, who believed that the artist's function in a materialistic age was to legislate taste.

The force of Pre-Raphaelitism was not spent so much by excess as by the failure of subsequent movements to realize the implications of its aesthetic beliefs. Although it was not the most important aesthetic movement in the 19th century, the Pre-Raphaelite Movement served to preserve the principles of beauty and truth vital to the development of art.

275 pages. \$3.55. Mic 56-2259

## YANKEE JOURNALISTS IN EUROPE, 1830-1848

(Publication No. 17,055)

Thomas Hungerford Giddings, Ph.D.  
Columbia University, 1956

This is a study of the European reports of a group of American correspondents who wrote chiefly for the New York City newspapers. The more important writers considered are James Gordon Bennett, Erastus Brooks, William Cullen Bryant, William Cox, Theodore S. Fay, Margaret Fuller, Charles H. Peabody, Bayard Taylor, Robert Walsh, Thurlow Weed, and Nathaniel P. Willis. Several anonymous reporters who wrote extensive correspondence are also included. The study shows the response of these writers to Europe and the picture of Europe which they presented to the newspaper-reading public. It is organized on the basis of the several attitudes or biases with which they viewed the various facets of the European scene.

The journalists are depicted as romanticists reliving Europe's Past; dilettantes viewing her arts; Protestants visiting her churches and observing her ceremonials; men of property reporting her economy; democrats criticizing her society; Puritan-reformers describing her morality, daily habits, and social welfare institutions; patriots recording her reception of the creations of American brains and hands; and self-critics assessing her attitude toward America and Americans.

As romanticists the reporters showed particularly the influence of Scott and Byron, and though there was a tendency to use Childe Harold as a guidebook, the mood seldom led to excessive veneration of Europe's wonders. Their criticism of the arts, dilettantish though it was, usually preserved its independence and rarely descended to slavish worship. Viewing the religious scene, the correspondents, most of whom were Protestants, were particularly harsh on the Roman Catholic Church. Their attacks were directed chiefly at externals, seldom at dogma. Their scattered comments upon European Protestantism lacked a common theme, and they all but overlooked Judaism.

The undivided land and the oppression of masses of people by the factory system were the most frequently condemned features of the economic scene. On the Continent, the large standing armies drew men from factory and field, driving women into work by which, in the eyes of the Americans, they were degraded. The social order appeared to be particularly undemocratic in England, less sharply stratified on the Continent. In their quest for signs of democratic advances, the correspondents looked hopefully to education and the press; they found more reason for optimism in the former than in the latter.

A tone of Puritanism pervaded the reports upon European morality. In many countries the standards, particularly of sex morality, seemed shockingly low. With reforming zeal the reporters commented upon drinking habits, the observance of Sunday, codes of justice, penal institutions, and the care of society's various unfortunates. Comparisons were regularly drawn between American and European practice, the advantage lying usually with the former.

The reporters gave considerable attention to the large number of Americans abroad. The "discovery of Europe" by Americans apparently began in this period rather than at the later date sometimes assumed. The achievements

of American actors, painters, and sculptors abroad offered attractive topics, as did the vogue of American books and the use of American products. In reporting on these, the correspondents were patriots, eager to praise all things American, and yet not totally uncritical in their bias. The correspondents became self-critics as they told of European attitudes toward Americans and America. They found much ignorance of America but more friendliness than hostility.

The study concludes with a brief survey of the effect of their European experiences upon the correspondents. Though their Americanism had sometimes been on the defensive, it was now reinforced by contact with the Old World. The journalists came home satisfied that the Past belonged to Europe but assured that the future was America's.

339 pages. \$4.35. Mic 56-2260

MEDIEVAL LITURGICAL DRAMA,  
THE ORIGIN AND RELIGIOSITY

(Publication No. 16,785)

Alphonse John Hotze, Ph.D.  
University of Missouri, 1956

Supervisor: Dr. Hardin Craig

Medieval liturgical drama developed spontaneously within the liturgy of the Western Church. It grew out of the liturgical forms of worship from monastic attempts to solemnize more vividly the divine mysteries celebrated on the feasts of Easter and Christmas and simultaneously to provide religious instruction, deepen faith and encourage piety.

Karl Young, Hardin Craig, and eminent scholars have written exhaustive studies on liturgical drama, starting with the first Quem quaeritis and treating its development down to the Reformation. This dissertation is a study of the liturgy and monastic practice that gave origin to liturgical drama to show that it grew undesignedly as a liturgical by-product.

I. The nature of liturgy is analyzed in its development from earliest Christian times until its fixation by Gregory the Great and its promulgation by Charlemagne to understand its vitality and the monks' deep intelligent love for it as worship of God.

II. In early medieval times the sacred liturgy was clearly understood as the public worship of the Church, through which the priesthood of Christ is continued, the work of redemption is renewed, the greatest glory given to God through Christ and the grace of redemption is communicated to the faithful who unite themselves with Christ.

III. The liturgical services consisted of psalms, antiphons, hymns, pericopes, collects, and other formularies.

IV. The monastic life of prayer and asceticism rotated around the Eucharistic Sacrifice and was governed and aided by the seven horae of the daily Divine Office and by the liturgical seasons of the ecclesiastical year.

V. Singing was always an integral part of worship. The Eastern Church advanced more rapidly than the Western Church in the use of hymns and antiphons. Romanus and Sophronius composed hymns of unsurpassed excellence for the great feasts of the Church. The Easter and

Christmas hymns of Romanus, done in antiphonal dramatic dialogue, were certainly known to the West. The Ambrosian Antiphonary contains hymns which are translations from the Greek. Paulinus, Alcuin, Hrabanus Maurus and many others composed hymns for the Church feasts that were later interpolated into the liturgical chant.

VI. Monastic life flourished throughout Europe during the early medieval times. St. Benedict's Regula was gradually adopted by all monastic communities for more co-ordinated and stricter religious discipline. Schools, staffed by competent scholars, were established at the monasteries. Charlemagne invited eminent teachers to his schola palatina. In the larger monasteries liturgical services were performed with precise ritual and elegant solemnity. Monastic scriptoria provided the service books; music schools supplied trained cantors and accomplished choirs. The monasteries of Fulda, Metz, Mainz, Reichenau, St. Gall, and others were illustrious centers known for the proper rendition of Gregorian chant and the inspiring performance of the liturgical services.

VII. The earliest available manuscripts show that the first embryonic liturgical drama was performed at St. Gall, where Notker Balbulus, for mnemonic reasons, added appropriate words to the long wordless melismata of the alleluia and started the custom of troping the chant. These interpolations were widely borrowed and imitated at other monasteries. The Quem quaeritis, a prefatory Easter Introit trope, composed in the style of antiphonal dialogue, was the beginning of liturgical drama.

VIII. The Quem quaeritis developed when it was transferred from the Introit to the end of Matins. It was there that the three elements essential to Drama, dialogue, action, and impersonation, came together. Born and developed at the foot of the altar within the liturgy, medieval drama remained essentially and typically religious down to the Reformation. 804 pages. \$10.05. Mic 56-2261

#### ROMANTIC NARRATIVE POETRY, 1790-1825

(Publication No. 17,064)

Karl Kroeber, Ph.D.  
Columbia University, 1956

An intense interest in narrative poetry characterizes the romantic era of English literature. This dissertation attempts to elucidate the causes of that interest, to describe the kind of poetry which it produced, and to define the basic patterns of its development.

There are three principal kinds of romantic narrative poetry: ballads, epics, and verse stories. The romantic poets, in general, were not primarily concerned with the ballad in itself. They used it as a means of modifying eighteenth-century conventions of lyric poetry. They employed it to extend the range of subject matter, to democratize the language, and to reconstitute (on organic principles) the organization of lyric verse. The most powerful motive for such use of the ballad was the romantics' desire to make specific, personal experience the foundation of their lyricism.

The romantics attempted "epic" poetry in order to modify what seemed to them the analytic and mechanistic ways of thinking of their immediate predecessors. They

strode to confound the "classic" genres within a comprehensive imaginative synthesis. They failed. They did not fully subordinate their interest in history, in psychological analysis, or in symbolic truth to the demands of sustained, heroic poetry. Hence many of the most interesting and beautiful romantic poems (i.e., The Lady of the Lake, The Prelude, The Ancient Mariner, Hyperion) are characterized by a partially unresolved conflict between the poet's desire for objective, "heroic" narrative and his subjective, idiosyncratic method of attaining it.

The verse story (a poem more extensive and less dramatic than the ballad but less ambitious than the epic) in part appealed to the romantics as an organic form which possessed a kind of democratic popularity and which allowed the poet's imagination to explore and to dramatize every kind of physical experience and fanciful speculation. In part, too, the romantics employed the verse story as a means of introducing into poetry not only new fictional techniques developed by eighteenth-century undertakings in prose narrative, particularly the novel, but also the new ways of understanding individual personality, society, and the natural world which underlay those techniques.

Considered together rather than separately, the romantic experiments with ballads, epics, and verse stories divide naturally into two distinct but interrelated patterns: the symbolic and the novelistic. The former is based upon the romantics' desire to find a method of validating artistically the universality of their personal, particular experience, either physical or mental. Because some romantics, especially Wordsworth, Coleridge, Shelley, and Keats, turned first to narrative as a source of organic form (rather than as a desirable end in itself), as they matured artistically they tended to submerge, to stylize, or to treat symbolically the ballad, epic, or verse story basis of their poems.

The second pattern, the novelistic, was in large measure produced by the effects upon romantic poetry of prose narrative (especially that of the novel), which was itself a literary expression of new psychological and cultural attitudes. Some romantics, notably Crabbe, Byron, and Scott, who had begun with simple narratives, progressed not toward symbolic treatment of story but toward an increasing concern with those preoccupations which distinguish the novel from other literary forms, in particular a focus upon sociological complexity. For this reason the ultimate contribution of these poets was a modification of the art of the novel, most clearly foreshadowed by the final cantos of Byron's Don Juan and the first books of Scott's Waverley series.

299 pages. \$3.85. Mic 56-2262

#### THE LETTER AS A DRAMATIC DEVICE IN SHAKESPEARE'S PLAYS

(Publication No. 16,979)

Katherine Elizabeth Moroney, Ph.D.  
The University of Oklahoma, 1956

Supervisor: Professor Joseph H. Marshburn

England of the sixteenth century felt the impulse of humanistic endeavor which extended education beyond the

confines of church and castle. At the same time, an expanding economic system increased the middle class whose growing business and social activity necessitated a knowledge of epistolography. Merchants required an epistolary form and style flexible enough for them to wield, not the style of the Latin formularies. This demand was met by the practical English letter writers of the latter half of the sixteenth century, a phase of the democratization of education inspired by the Humanists. These handbooks appeared in considerable numbers from the time of the first extant one in 1568.

That Shakespeare was acutely conscious of the increasing interest in letter writing can be inferred by his many references to the letter--well over 180 references. More than 140 letters are used in his plays; of this group 92 are certainly seen on the stage; others may have been. Forty-two are read or paraphrased.

It would ignore the importance of the letter in the dramas to say that Shakespeare was merely capitalizing on a topical interest. He found the device was dramatically effective. It allows for intimacy with the audience. Since the letter is written in the first person, the audience feels vicariously in the position of the recipient of the letter. In the traditional phases of the plot, it serves as a means for compression and selectivity; it integrates plot and subplot. It recapitulates off-stage action with an immediacy of effect. Frequently, by introducing or concealing information, it engenders suspense.

Like the soliloquy and aside, the letter through its style, either forthright or veiled, reveals the innermost character of the writer. Comments of the recipient as he reads disclose his character. It brings an absent character to a scene sometimes with even more force than his actual presence. The spectators enter creatively into the illusion of the stage, for they must envision the absent one.

The content of the letters may express gaiety, satire, seriousness, love, evil; the style may inspire laughter or tears. Letters are in prose and verse with the rhythm of the scene being manipulated to emphasize the message. Letters often engender much comic activity, much sheer entertainment. On the stage the letter is as vital as a character since it has voice and movement. It calls attention to itself because it is written material being read. For that reason emotional response, either motivated by a comic or tragic impulse within the letter, must be retained until the lines are read, only to explode in laughter or to react in pity and fear. Thus, the letter assists in creating tone and atmosphere. For these reasons Shakespeare, realizing its dramatic effectiveness, used and re-used the letter in his plays.

155 pages. \$2.05. Mic 56-2263

Chrysostom best known in the West during the Middle Ages, belongs to the literary genre of the consolatio. Written by the saint while in exile at Cucusum shortly before his death, it develops an idea found earlier in the writings of Plato and the Stoic philosophers. The man who does not harm himself, cannot be harmed by any other person. The means of development Chrysostom employs are numerous scriptural examples, the most important of which are Job, Lazarus of the parable, and the three boys in the fiery furnace. There is comparatively little abstract reasoning in this work, and its concrete imagery and wealth of examples reveal Chrysostom to be a popular preacher and not a deep philosopher.

This new edition is based upon seventeen manuscripts which fall into three main groups. Group I includes the following codices: Paris, Ancien Fonds Grec 764; Codex Vaticanus Graecus 551; Oxford, Codex Thomas Roe 24; Paris, Codex Coislin 147. In addition to being set off from the other codices by important variant readings, this Group corresponds most closely with the text of the early Latin translation. Group II includes Paris, Ancien Fonds Grec 730; Florence, Plut. IX, Codex 35; Turin, Codex Graecus 99; Oxford, Codex Cromwellianus 20; Berlin, Codex Graecus 38; Oxford, Codex Laudianus 17. The manuscripts of this group are closely related to one another, but as a group they are not as important as Groups I and III. The fact that none of these manuscripts is earlier than the Eleventh Century and that they all have exactly the same title seems to indicate a close dependence upon a late common source. Group III includes Paris, Ancien Fonds Grec 759; Paris, Ancien Fonds Grec 1458; Paris, Ancien Fonds Grec 912; Munich, Codex Graecus 6; Codex Vaticanus Graecus 568; Paris, Ancien Fonds Grec 796. As a group the manuscripts of Group III are not related as closely to one another as those of the other two groups. The sub-group IIIa, Paris, Ancien Fonds Grec 759, 1458, and 912, contains the three most closely related of all the manuscripts. Codex Vaticanus Graecus 568 and Paris, Ancien Fonds Grec 796 manifest a special affinity in several crucial readings. One manuscript, Codex Vaticanus Graecus 555, does not fit consistently into any of the established groups. It exercised an influence upon the earlier printed editions which is out of proportion to its real merits. By the use of many more manuscripts than previous editions, this new edition attempts to reproduce Chrysostom's text more accurately, and to do away with some obvious additions which have been accepted by earlier editors. The use of a larger number of manuscripts gives us a clearer perspective of the relative merits of each manuscript, and enables us to free the text from too great a dependence upon the Vatican manuscripts 555 and 568, which was a common fault of the earlier printed editions.

116 pages. \$1.50. Mic 56-2264

#### LANGUAGE AND LITERATURE, CLASSICAL

SAINT JOHN CHRYSOSTOM, QUOD NEMO LAEDITUR  
NISI A SEIPSO, A NEW CRITICAL EDITION

(Publication No. 16,996)

John Joseph Canavan, Ph.D.  
Cornell University, 1956

Quod nemo laeditur nisi a seipso, the work of John

**LANGUAGE AND LITERATURE,  
LINGUISTICS**

**A STUDY OF SOME FACTORS IN THE WRITTEN  
LANGUAGE OF A GROUP OF TEXAS LAND-GRANT  
COLLEGE FRESHMEN TO SHOW HOW THE NATURE  
OF THE LANGUAGE REFLECTS THE SOCIO-  
ECONOMIC BACKGROUNDS OF THESE STUDENTS**

(Publication No. 16,585)

Anna Lucille Campbell, Ph.D.  
New York University, 1956

This study is an investigation of the written language of a group of Texas Land-Grant College freshmen of three socio-economic groups.

The basic purpose of the investigation was to show the relationship between the function and structure of the written language of these students and their cultural background. The assumptions upon which this purpose is predicated are:

the learning of language takes place in a cultural context, and the language learned is a reflection of the culture

the language of a specific geographical area will contain elements that are regional.

The methodology of this study was both quantitative and qualitative and achieved by contextual analysis involving three phases: identification, comparison, and reference. The first phase was accomplished by identification of the 1952 freshman population into stratified socio-economic status groups by use of father's occupation. The second phase involved discovery and a comparison of language usage, according to structure and function, of subjects in the three groups.

The procedure was as follows:

Selection of subjects for the study was accomplished by dividing the 817 students in the 1952 freshman class at Prairie View College (Texas) into three socio-economic groups: the highs (Group I), mediums (Group II), and lows (Group III) on the basis of the occupation of fathers. All 817 individuals were then assigned numbers as determined by Kendall and Smith's "Tables of Random Sampling". One hundred individuals were then selected from each of the three groups and by this procedure a stratified random sample of students was obtained (300 in all).

The data collected consisted of three written compositions, from each student, a total of 900 pieces of writing. Theme topics were "assigned-subjects", "Why I came to College", "Why My Father Wanted Me to Come to College", "Why My Mother Wanted Me to Come to College" and "free-choice" which included "Why I Wanted the Dodgers to Win", "Being a Negro Is (Is Not) a Handicap," "Advice I Would Give a Freshman", "Am I Prejudiced?", "I'll Take America Every Time". Examination of theme content consisted of structural analysis (statistical) and functional analysis (descriptive).

The data, error frequencies, secured from structural analysis on basis of ten technical writing skills, were treated statistically by securing means, standard deviations, expected "t"-test sums and actual "t"-test sums. Data secured from functional analysis, language usage in communicating experiences, thoughts, feelings, and atti-

tudes about vocations, education, ambitions, environment, race, and world affairs, were treated descriptively.

Findings revealed statistically: that significantly fewer students in Group I made usage errors than students in Groups II and III; that Group I students made fewer errors in sentence structure, use of prepositions and conjunctions, and diction than students in Groups II and III; that no significant differences among the groups occurred in verb usage, pronoun reference, use of modifiers, spelling, grammar, punctuation, and use of adjectives and adverbs.

Conclusions reached from contextual treatment of language were that different socio-economic levels dictate different functions for which students use language, that this difference can be observed in different classifications of students within a group level.

From knowledge of what the student's language is, as well as what it ought to be; from background information concerning the student, curriculum makers and teachers can be guided in planning content, selecting textbooks, and in teaching content more meaningful to the particular students whom they teach. Guidance counselors could be aided immeasurably in guiding students in vocational choices. The research scholar, it would seem, might use these data for additional studies in language and culture.

226 pages. \$2.83. Mic 56-2265

**THE DIALECT OF  
THE FREUTSMOOS AREA (BAVARIA)**

(Publication No. 17,003)

Herbert Leopold Kufner, Ph.D.  
Cornell University, 1956

This dissertation is a structural analysis of the dialect spoken in the Freutsmoos area, Bavaria. It is composed of four chapters (Descriptive Phonology, Prosodic Features, Morphology, Historical Phonology), preceded by an introduction and followed by two appendices. The introduction defines the language analyzed in this study, namely the rural Middle Bavarian dialect of the Freutsmoos area, based upon the speech of three major and about 20 minor informants. Certain external information regarding the dialect is given (geographical and historical sketch of the area, recent influences on the dialect, biographical information on the major informants).

The first chapter lists the phonemes, describes their allophones in terms of their place of articulation, and describes the distribution of the phonemes. The segmental phonemes are as follows:

Consonants: b d g f s š h m n ŋ l r (j w)

Vowels: i e ε æ a ɔ o u, e ɛ a ɔ ɒ (i u)

Diphthongs: ei ai oi oi ui, ia ea ɛa oa ua, iu au ou

The second chapter describes the prosodic features of the dialect with special emphasis on stress. Juncture and intonation are also discussed. The prosodic features found are these: word stress, constructive stress, phrasal stress, secondary stress; space juncture, four levels of pitch, and three terminal junctures.

The third chapter opens with a general statement on morphology. Then all inflected words in the dialect are

classified in various groups and sub-groups. The major groups comprise: nouns, determiners, adjectives, numerals, verbs. The inflections of these groups are described and paradigms are cited to illustrate them.

The last chapter attempts to describe the historical origin of the segmental phonemes of the dialect. For the consonants, Proto-Germanic is used as a point of departure and it is found that we have to assume a separate development for the dialect as early as Pre-Old High German, i.e., it would be impossible to derive the dialect's consonant phonemes satisfactorily from those of recorded Old High German. A special effort was made to keep the discussion at all times on a structural level and to describe the changes which occurred in their effect on the phonemic system as a whole. The starting point for the vowels is the syllable nuclei of Middle High German. Their development is traced down to the modern dialect, with special sections on the development of nasal vowels and the great number of diphthongs which came about through the vocalization of post-vocalic /l/ and /r/.

The Appendices contain a map giving the location of the informants' native villages, two selections from the corpus, and an index listing those items which occur in the text of the thesis. 162 pages. \$2.15. Mic 56-2267

#### OUTLINE OF KHMU STRUCTURE

(Publication No. 17,081)

William Allen Smalley, Ph.D.  
Columbia University, 1956

The Khmu language is spoken in North Laos by people of that name (spelled in various ways in the scanty literature: Khamou, Khmou, Khamuk, Kamhmu; also called Phouteng). It belongs to the Austroasiatic language family.

The present study is a description of the grammatical structure of Khmu, worked out with as close a parallel between the approach to the phonology and to the rest of the grammar as the data seem to warrant. It serves as a test of the usefulness of applying the same kind of structural analysis to the phonological as to the non-phonological aspects of a given language, within the general American descriptivist tradition.

A critical survey is made of the writers who have discussed such problems as an immediate constituent analysis of the phonology, the syllable as a structural unit, and phoneme classes established on the basis of their distribution. The present study differs from many of these in that it uses no phonetic information in analyzing distributions (although phonetic information is used in establishing phonemes). The criteria for the analysis of the relations between immediate constituents (whether on the phonological level or morphological level) are stated, as are the procedures for determining classes (of phonemes or morphemes).

The main body of the dissertation applies these criteria to a detailed analysis of the grammatical structure, treating the phonology first, and then the morphology (using the latter term for the non-phonological parts of the grammar). After the phoneme inventory and an analysis of the allophones, the following phoneme classes are established

on the basis of their distribution in defining frames: consonant, vowel, terminal juncture, internal open juncture, pitch, stress, and extra length. Subclasses of some of these are also established, again on distributional grounds. Constructions of phonemes, with their IC relation, are then indicated in a rising hierarchy. One level in the phonological hierarchy is the syllable. Another above that is the phrase. In similar manner, morpheme classes are established by their distribution in defining frames, and their constructions are plotted, first on the intra-word level and then on the inter-word level. A sample text with an analysis of the morphological structure closes the description.

The conclusion summarizes some of the difficulties and advantages in the approach. It seems applicable to Khmu, but whether or not it would be equally applicable to other languages of different structure is of course not determined by this one analysis.

119 pages. \$1.50. Mic 56-2267

#### THE LANGUAGE OF THE TOWNELEY PLAYS: A COMPARATIVE ANALYSIS OF THE IDENTICAL YORK AND TOWNELEY PLAYS, THE CAESAR AUGUSTUS, THE TALENTS AND THE STANZAS OF THE WAKEFIELD MASTER

(Publication No. 16,754)

Martin Stevens, Ph.D.  
Michigan State University, 1956

This dissertation attempts to analyze the language of the Towneley cycle, in order to test the most important hypotheses regarding: (1) its composition and growth, (2) its relationship to the York cycle, and (3) its geographical location.

The Towneley cycle is a heterogeneous collection of medieval craft plays, generally attributed to the city of Wakefield in the West Riding of Yorkshire and dated approximately in the first quarter of the fifteenth century. The single extant manuscript of this collection of plays, now located in the Huntington Library at San Marino, California, is assigned a date of ca. 1460 by paleographers. It consists of a total of thirty-two plays, of which all but the last are written in the same hand. The individual plays differ widely in metrics, some, including the famous Second Shepherds' play, containing nine-line stanzas of the so-called Wakefield Master, who has been lauded by many critics not only for the perfection of his lines, but also for his racy humor, his superior dramatic technique, and his biting commentary. Moreover, a number of the plays within the cycle differ by reason of their origin. At least five of the plays were apparently borrowed from the craft cycle of the neighboring city of York. These plays, the Pharao, the Doctors', the Harrowing of Hell, the Resurrection, and the Judgment, bear a word for word resemblance to large sections of their counterparts in the York cycle, a collection of forty-eight plays, dated roughly in the fourteenth century.

These differences among the various plays in Towneley have raised certain questions concerning the composition and growth of the cycle, which to date have not been answered with certainty. Since the publication of the first

text of the Towneley plays in 1836, scholars have addressed themselves to a variety of problems, among them: (1) Exactly what are the sources of the several plays in the cycle? The York cycle is most likely one of these sources, but when and how were the York portions incorporated into the Towneley cycle? Was there perhaps a parent cycle or a common original? Were there other direct sources for the Towneley plays? (2) Are some metrical patterns in the cycle, therefore some of the plays, older than others? If so, what group of plays seem to be the original one? Is it possible that plays were collected from different sources at one time? (3) Is there any evidence of editorial revision in Towneley? To what extent did the Wakefield Master have a hand in the writing or revising of plays that do not contain the nine-line stanza as the basic form?

Scholarly attention has also been directed toward the establishment of the original home of these plays. While manuscript and external evidence have provided reasonably clear proof that the cycle was performed at Wakefield, Yorkshire, there is nonetheless some conflicting evidence which would assign the plays to Woodkirk, a village in the proximity of Wakefield. Moreover a few scholars have suggested the identification of the Towneley cycle with the city of Beverly, which is known to have presented a craft cycle, and others have suggested a Lancashire origin on the strength of the manuscript history. Though most contemporary scholars have accepted the Wakefield theory, the question concerning the original home of the cycle has by no means been answered with certainty.

In an effort to shed some new light upon these problems of composition and origin, I determined to examine the language of the Towneley plays. To provide a limitation for the study, I chose to concentrate on the following plays, which, because of metrics or origin, are representative of the several strata in the Towneley cycle: (1) the five identical York and Towneley plays, (2) the Caesar Augustus, (3) the Talents, and (4) any three plays written entirely in the Master's stanza. The identical York and Towneley plays I selected because they provide a fine opportunity for testing the dialect differences between the two cycles. The Caesar Augustus, written entirely in rime couée, is a representative of the group which many consider the earliest in the Towneley cycle. On the other hand, the Talents, because of its heterogeneity in metrical patterns, is normally considered a later addition, and its origin has been much in doubt. Finally, I selected a number of the Master's plays in order to determine to what extent the language in these plays is different from all the other strata in the cycle.

The linguistic study is based on the complete incidence in the plays selected for analysis of some thirty-seven Northern and Northeast Midland dialect traits. The material in this thesis has been arranged into various broad headings, under each of which those criteria which are treated alike in all plays, and those which show differences have been given a separate place. A complete list of incidence may be found in the appendix, while the discussion in the body of the thesis contains a quantitative analysis of forms occurring in rime and within the line, an evaluation, and a statement of the historical background of each linguistic trait.

Due to the many limitations of this type of investigation, the conclusions of this study must be offered as tentative. However, a few statements can be made with reasonable certainty. In the first place, the language of the

Towneley plays is not only later but also less regional than that of the York plays. Dialect changes in the identical plays seem to indicate that the Towneley plays did not use as many Northern traits as did the York plays. Secondly, the large number of linguistic differences among the various plays in the Towneley cycle indicates that the plays were not written by one man nor derived from one source. The Talents alone among the plays examined for this study can be considered on linguistic grounds to be a pure Northeast Midland document, though all of the plays could well have been performed at Wakefield in spite of the occasional appearance of traits typical of more Northerly areas. Finally, the linguistic evidence does not support the notion that the Caesar Augustus is an earlier composition than the other plays in the cycle. As a matter of fact, there is at least a suggestion in the evidence that the Caesar Augustus and the plays borrowed from York were incorporated into the Towneley cycle at the same time and that they were edited by the same man. Pending a study of other plays in Towneley, these statements summarize the most important conclusions to be obtained from the linguistic evidence on the provenience, growth and composition of the Towneley cycle.

283 pages. \$3.54. Mic 56-2268

#### THE LINGUISTIC IMPLICATIONS IN THE THEORY AND POETRY OF STÉPHANE MALLARMÉ

(Publication No. 17,014)

Marvin Elmer Weinberger, Ph.D.  
Cornell University, 1956

This study is an attempt to treat a literary problem with scientific linguistic theory and methodology. The literary problem chosen, the esthetics of Stéphane Mallarmé, is one which is readily seen to have definite linguistic implications, and which could, therefore, profit from such an unconventional approach.

In the science of linguistics, the analysis of literary usage has remained up to now relatively unpracticed. Because of basic problems of structure, linguistics has had to neglect the theoretical study of that corpus of usage known arbitrarily as "literature." Nevertheless, some studies have been made in this vein. The paper discusses first those studies which have been made. Then it draws from them the principles which might be used in a linguistic approach to Mallarmé's esthetics.

The Prague School of linguistics is discussed first, for it was the earliest to be cognizant of the importance of literary usage in linguistic study when it stated that poetical language causes elements of structure below the level of meaning to become exposed.

The Copenhagen School of linguistics is then referred to, for it has also approached the problem of literary esthetics. Work has been done in this School to formulate basic concepts of literary structure. Analysis is made first of this School's charting of the "literary sign," based on the Hjelmslevian conception of the linguistic sign ( $E \rightarrow C$ ), and then of its attempts to define literary genres, in relation to functions of the formulated literary sign.

Other linguistic studies on literary esthetics, such as those of Vendryes in France and Mukařovský in Czechoslovakia, are also mentioned.

slovakia, as well as literary studies of a linguistic nature, such as those of Paul Valéry, are also discussed for their possible value in our specific problem.

Mallarmé's poetry is then treated in the light of these studies. The linguistic implications in Mallarmé's works were seen to be of four types:

- I. Systemics, referring to the abstract patterning which Mallarmé intended to form from the relationships between linguistic signs;
- II. Idealism, referring to Mallarmé's intentions, resultant from German Idealism, of forming through poetry a perfection of linguistic structure, the reading of which would give a perfection of experience;
- III. Musicality, referring to the principles of musical structure which Mallarmé tried to incorporate in his usage of language; (In relation to Musicality, the paper contains a statistical analysis of the componential vocalism of Mallarmé's works. These statistics are then compared to a standard, to discover the nature of the phonological distortions which Mallarmé did effect. Finally, the distortions are discussed in view of their possible relationships to semantic qualities.)
- IV. Wagnerianism, referring to Mallarmé's intentions, resultant from the Symbolists' conception of Wagnerian esthetics, of creating a perfect amalgam of the essence of all the arts through his particular usage of the linguistic sign.

In conclusion, it is suggested that Mallarmé's idealistic theories of the usage of language in art were based on premises contrary to the structural nature of the linguistic sign, as this is conceived in linguistic science today. For this reason, Mallarmé's poetry, though great artistically, is as Mallarmé himself admits in his last work, Un coup de dés jamais n'abolira le hasard, the manifestation of a failure.

202 pages. \$2.65. Mic 56-2269

#### LANGUAGE AND LITERATURE, MODERN

##### THE TRAGIC HUMANISM OF ANDRÉ MALRAUX: AN ESSAY OF INTERPRETATION (VOLUMES I AND II) (Publication No. 15,813)

Charles Daniels Blend, Ph.D.  
The Ohio State University, 1955

During a lecture delivered under the auspices of the United Nations Educational, Scientific, and Cultural Organization, André Malraux remarked that a humanism was possible, but that it must be made very clear that it would be a tragic humanism. The major purpose of the dissertation is to attempt to define this humanism and to examine and interpret its most important elements as they manifest themselves in Malraux's own works. Several other problems relate directly to the foregoing ones. Most vital of these is the effort to demonstrate that all of Malraux's

writings derive from the same tragic vision of human existence, and that such a vision can be sufficiently fertile to serve as the basis for a humanism. In addition, this paper tries to discover the spiritual antecedents of Malraux's world vision and to trace the course of events that led to its present form; in short, to situate it in a historical and intellectual context.

This last process reveals that the closest parallel to Malraux's fundamental attitude is to be found in the one that lies at the base of ancient Greek tragedy: man struggling against his destiny. Of all Attic tragedy none is as close in vision to Malraux's works as Aeschylus' Prometheus Bound. This hypothesis is supported by Malraux's frequent references to both Aeschylus and Prometheus in connection with the position which he himself espouses. The key point with respect to the Greeks' tragic sentiment of life is that it did not prevent them from producing a culture that has served as an inspiration for most humanists.

The dissertation takes the position that the most important single link between Aeschylus and Malraux is Friedrich Nietzsche, and that in the latter's interpretation of Prometheus Bound is to be found in the same tragic attitude that motivates Malraux's humanism. The appearance of such an attitude in contemporary times is seen to be mainly the result of the decline of faith in all these things which seemed to promise an answer to the problems of human destiny: science, religion, and the idea of inevitable progress.

For purposes of analysis, Malraux's treatment of man's struggle against destiny, the essence of his humanism, is broken down into three principal parts. The first is the battle against man's own inner flaw, his destructive potentialities: the ethical aspect of Malraux's humanism. This theme is traced through all of his works to its culmination in the concepts of human dignity and virile fraternity.

The second or aesthetic aspect is the struggle with the gods, for Malraux visualizes the artist essentially as one who re-creates the forms of the universe that the gods have made. From the philosophical point of view, the vital part of Malraux's art theory is the idea of resurrection and metamorphosis, the path by which man's artistic heritage transcends death and is renewed. All of these ideas are developed most fully in Les Voix du Silence, but examination of Malraux's earlier works reveals that they have always been present, at least in germ.

The third aspect, the fundamental struggle with the earth in order to exist, is the element that Malraux finds as common to all mankind. It constitutes part of his refutation of Spengler. Directly related to this is Malraux's concept of conscience: the consciousness of what it really means to be a man, derived from the experience of being one.

Two other problems dealt with are Malraux's approach to the absolute and to a fertile relationship between the individual and society.

All of Malraux's tragic humanism adds up essentially to an interrogation of man and the universe. It offers no plan for human existence, but views life as a fraternal adventure in which man struggles to make the most possible of his time on earth. 434 pages. \$5.43. Mic 56-2270

A STUDY OF THE PROSE STYLE OF  
WILLIAM CARLOS WILLIAMS

(Publication No. 17,215)

J. Gysbert Bouma, Ph.D.  
University of Pennsylvania, 1956

Supervisor: Dr. E. Sculley Bradley

Williams' expression in the form of the poem has established him among five or six of the important poets of the first half of the present century; on the other hand his prose work has remained comparatively obscure because he has ignored the demands of publishers by writing "as he pleased" in his own unique style. Williams has published eight full-length volumes of prose, which include novels, short stories, sketches, and essays; his total expression in prose in quantity of words far exceeds his total output in the form of the poem. Therefore, a study of Williams' "non-poetic" writing seems important if literary criticism would properly evaluate the "whole man."

This dissertation is an attempt to interpret the significant originality of Williams' prose style, to discover how Williams expresses himself and his milieux through the medium of words in a prose form which achieves the quality of uniqueness, and to show the types of subject matter which vitalize his imagination toward expression in prose.

To understand Williams' essential drive to achieve expression in vivid prose, I point out biographical data to show his intense desire to communicate what he observes. And because he is primarily a poet, his unique qualifications to communicate through the form of the poem obviously reflect themselves in his prose style. I attempt to demonstrate that his prose style is organically related to his poetic style by making comparisons of select poems with the prose writing; and clarification of this influence requires a definition of terms. Unfortunately critics have said that Williams writes a "prosey poetry," and they also have acclaimed his "poetic prose."

I investigate the prose itself to determine Williams' manner of expressing his thoughts, his personality, and his materials. These prose writings include his novels, essays, short stories, experiments in the stream-of-consciousness technique, and the unpublished items in the Lockwood Memorial Library at the University of Buffalo.

Williams, a medical doctor carrying on his profession in Rutherford, New Jersey, can repeatedly observe certain objectified facts of modern civilization and assimilate them thoroughly by his constant associations with all kinds of conditions of life. These objectifications have been integrated with his sensitive personality to enhance his prose style. Some of the subject materials he uses, together with his style of expressing them in the colloquial American idiom, are studied to show how the materials affect the style. Moreover, the creative works of various writers also become part of Williams' subject material; the original manner in which he is critical of the work of others is included in my discussion.

An estimate of Williams' place in the progression of American literature is made, but any effort to establish him permanently is certainly not the intention of this dissertation on so contemporary a literary figure. We are too close to his individual work to achieve the necessary perspective. However, this study does suggest certain determinants to show why future receptivity of Williams' prose work will probably be greater than it is at the moment.

248 pages. \$3.20. Mic 56-2271

FEDERICO GAMBOA, NOVELIST OF TRANSITION

(Publication No. 16,929)

Charles William Butler, Ph.D.  
University of Colorado, 1955

Supervisor: Professor Ralph E. Warner

Federico Gamboa, the Mexican novelist, has been frequently referred to as a naturalist, and a follower of the school of Emile Zola. A close examination of his works demonstrates that they are not essentially naturalistic, nor did he intend them to be. His literary production was dominated not so much by determinism as by a fatalism which he considered to be a part of his cultural heritage and of the heritage of all Hispanic peoples. This strain of fatalism gives a tone to his works which makes them seem more closely allied to classic tragedy than to naturalism.

He was also a career diplomat between the years 1888 and 1914. He served his country during the greater part of the incumbency of Porfirio Díaz, and after the dictator's fall he was Minister of Foreign Relations during the brief reign of Huerta.

In spite of his connection with the Díaz regime he managed to retain a sufficiently objective point of view to produce a number of novels and plays which depict with great psychological penetration the transitional character of Mexican life in the years immediately preceding the Revolution. He was, in fact, one of its intellectual precursors.

He devoted himself so intently to publicizing the worst features of positivist Mexico that he was frequently in trouble with his superiors who did not always consider him very loyal to the regime. There was no social ulcer in Mexican life which escaped his attention.

By giving an accurate picture of conflicting tendencies in the religious, political and social spheres, Gamboa not only set down for posterity the atmosphere of an era, but by attempting to analyze the bases of these conflicts he contributed toward the understanding of some of the dilemmas inherent in Spanish culture.

117 pages. \$1.50. Mic 56-2272

JEAN ROYERE AND LA PHALANGE

(Publication No. 17,422)

Ralph Fletcher Carl, Ph.D.  
University of Michigan, 1956

The purpose of this dissertation is to provide a study of the French literary review, La Phalange, and its director, Jean Royère. La Phalange, which Royère hoped to make a rallying point for poets in the symbolist tradition, was published from July, 1906, through May, 1914. The first chapters of the dissertation give a biographical account of Royère, explain the rôle of the "little" review in modern French literature, and relate the history of La Phalange. These are followed by a presentation of the critical opinions expressed in the review on contemporary music, art, and drama. The principal music critic, René Chalupt, was strongly nationalistic in outlook and never tired of attacking the Germans while he rarely found fault with a French composer. Léon Werth, the most important art critic of the review, placed Bonnard, Vuillard, and Marquet above other contemporary painters. Principal

critics of the drama were Royère, Ricciotto Canudo, and Jean Florence. Following the failure of their efforts to have the symbolist plays of Viele-Griffin, P.N. Roinard, and Saint-Pol-Roux produced they became supporters of the Théâtre des Arts while it was under the direction of Jacques Rouché and the Théâtre du Vieux Colombier directed by Jacques Copeau.

Throughout its existence La Phalange gave evidence of marked interest in foreign literature, particularly works by British and Scandinavian writers. Whitman was the most notable exception to this rule. Valéry Larbaud and Jean Florence were the most active men in this field. Numerous essays and critical articles were published and occasionally pieces by foreign writers, translated into French, were included in the review. The prose of La Phalange was, on the whole, unimpressive. The best things to appear were Albert Thibaudet's Les Images de Grèce and two chapters of his Mallarmé as well as short stories by Valéry Larbaud and brief pieces by Jules Romains and Francis Carco.

A remarkable variety of poetry was published in the magazine despite the fact that anything written in the vein of the Parnassians or the romanists was excluded. Among the numerous poets who published here the most outstanding names were Romains, Carco, Verhaeren, Jammes, Spire, Viele-Griffin, Breton, Apollinaire, Nau, and Royère.

Appended to the dissertation is a complete index of the authors and material published in the review.

In conclusion it can be said that La Phalange was one of the most important reviews that helped bridge the gap between La Revue blanche and La Nouvelle Revue française. Royère was always eager to discover new talent and his review provided a means of publication for many unknown writers whose works showed promise of genius. His most illustrious discoveries were Valéry Larbaud and Albert Thibaudet, but many other writers who had gotten a start elsewhere strengthened their position by publishing in La Phalange. Royère's devotion and enthusiasm for Mallarmé were largely responsible for the reestablishment of the master of symbolism in his proper position in the panorama of modern French literature.

288 pages. \$3.70. Mic 56-2273

tions or motifs upon which each work is based. She was by profession a critic of literature, to which her many volumes of literary essays attest. These volumes are invaluable in the solution of the problem.

A careful examination of her creative trajectory reveals that virtually all her novels were written to satisfy the demands of a tradition or theory. To some extent this is probably true of any artist, but Pardo Bazán makes it her principal preoccupation.

Contrary to what one might expect, few of these traditions are Spanish. Her first novel, Pascual López, is clearly inspired by the Spanish picaresque novel. Insolación shares the deepest themes of the Generation of '98. But French literature of the nineteenth century is the principal source of her themes and techniques. Naturalism is easily discernible in works like La tribuna, Los pazos de Ulloa, La madre naturaleza, and La piedra angular. However, naturalism constitutes but one portion of her novelistic production. In volume at least, French romanticism is the greatest single body of literature whose influence may be perceived in the Pardo Bazán novel. The list includes the names of Saint-Pierre, Rousseau, Chateaubriand, Lamartine, Hugo, and Vigny. One also finds the impact of Flaubert, Balzac, and Huysmans in such novels as El cisne de Vilamorta, Un viaje de novios, and La quimera. In the latter half of her career, Dostoevsky and, especially, Tolstoy hold an equally powerful attraction, as witnessed in Una cristiana and La prueba.

Occasionally Pardo Bazán is successful in re-creating a given tradition. For example, the theme of the noble savage corrupted by society is expertly transformed into a tragedy of modern Galician rural society. But frequently the sophisticated reader is painfully aware that the tradition or theory or plot has been bodily transplanted from the work of another writer. This is the principal defect of El cisne de Vilamorta, a transparent imitation of Madame Bovary, and La quimera, which seems obviously inspired by Huysmans' A rebours. One can only conclude that the author lacked the inventive genius necessary to sustained artistic creation. Unknowingly perhaps, she was prone to conceive of art as a literary exercise rather than as a creative experience. Los pazos de Ulloa, her fifth novel, prophesied a brilliant novelistic career, but Emilia Pardo Bazán was quickly attracted by other artistic fashions and modes. There is little doubt that this fact contributed to the mediocre quality of her later novels.

233 pages. \$3.05. Mic 56-2274

#### THE ROLE OF LITERARY TRADITION IN THE NOVELISTIC TRAJECTORY OF EMILIA PARDO BAZÁN

(Publication No. 17,382)

Arthur Alan Chandler, Ph.D.  
The Ohio State University, 1956

The creative process in the novels of Emilia Pardo Bazán represents a departure from usual literary techniques in that the author habitually works from the theory to the creation. Literary analysis and history ordinarily are the product of the artistic creation itself. In the works of Pardo Bazán, however, the ideal relationship of art to theory suffers a rather incongruous reversal. In this sense she might properly be termed a practicing theorist in the novel. The central purpose of the study has been to conduct a chronological analysis of Bazán's novels in order to identify and determine the probable source of the tradi-

#### STEPHEN LEACOCK: HUMORIST AND HUMANIST

(Publication No. 17,221)

Ralph Leighton Curry, Ph.D.  
University of Pennsylvania, 1956

Supervisor: Dr. Sculley Bradley

This biography and literary evaluation is the result of research into life records, a scanty supply of published biographical sketches, correspondence, and the business files of Leacock and his publishers. The author also had access to Leacock's many journals and account books. Many of the Canadian friends of the humorist were kind

enough to allow interviews. The study also includes a fifty page bibliography.

Stephen Butler Leacock came to Canada at an early age. After an education, beginning in a little red schoolhouse in Upper Canada and ending with his Ph.D. from the University of Chicago, he was appointed chairman of the Department of Economics and Political Science at McGill University. His long service at McGill, from 1900 to 1935, constituted one part of his life; his equally long period of authorship, from 1907 to his death in 1944, served as the other half of his dual career. His life and writing were affected by two events, the death of his wife in 1925 and his abrupt retirement in 1935. The decade between these two dates was his period of least careful workmanship.

His death in 1944 brought to an end an active and remarkable literary career. He had written sixty-one volumes: thirty-five of humor, six of political science, two of economics, nine of history, one of professional education, five of criticism, and three of biography. At least a dozen of the latter volumes were scholarly writing. He had written eighty-eight serious articles, thirty-four of which were learned offerings.

Stephen Leacock represented in a way the paradox which is Canada. Born in England, he moved to Canada and wrote American humor. But this was the simplest of the inconsistencies that his life and personality presented. He was the untidy man with the orderly mind, the man who could not drive a car but could explain the theory of relativity. These are true paradoxes, however, because they only seem to represent incongruities. At the source, Leacock was a humanist in the broadest sense; his study and his interest was humanity, not facts and figures. The man was at the same time lecturer, teacher, economist, scholar, political scientist, humorist, historian, and bon vivant. Everything he wrote and everything he did was based upon a recognition of human dignity.

Leacock's total work, varied as it was, was unified by its continual insistence that man, and only man, was important. The economist wittily declared that Malthus was the "apostle of the empty cradle." The historian said of one of his books, "Read the pages on Toronto in the Confederation period. It's real history, being my own recollection of 1876-78." The teacher, head of his department, said to his staff, "Bite off a small piece of your subject and chew it well." The political scientist explained, "Socialism won't work except in Heaven where they don't need it and in Hell where they already have it." The humorist believed quite seriously that "the very essence of good humour is that it must be without harm and malice." These statements suggest what Leacock proves to be, one who believed with Pope that "The proper study of mankind is man."

It is as a humorist, of course, that Leacock is important. Study shows him to have been popular and competent. By his own admission in his criticism, Leacock was an American humorist, and he gave as freely of the tradition as he got. The exuberance, the style, the technique--indeed, the whole of Stephen Leacock's contribution to laughter placed him within the pale of the world's most admired humor. 411 pages. \$5.25. Mic 56-2275

### INTERROGATIVE PATTERNS OF SENTENCE UNITS IN CONTEMPORARY CASTILIAN DRAMATIC SPEECH

(Publication No. 17,023)

Rodger Alvin Farley, Ph.D.  
The Florida State University, 1956

A review of what has been said concerning interrogative arrangement in Spanish reveals that the matter has only been touched on, that no linguist has ever made a thorough study of it, based on a sizeable corpus of contemporary examples. This investigation aims at presenting an objective description of the structural patterns in interrogative discourse. The term "structural" refers only to the larger functional segments of an utterance. It neither considers the word constituents of which a unit may be composed, nor does it concern the morpheme.

In order that the conclusions be of the greatest possible value, from a pedagogical point of view, the corpus of examples was extracted from thirty Spanish plays whose premieres in Madrid took place within the last nine years. The reason for choosing the modern theater is twofold: (1) it provides demonstrable, provable data; (2) the language of the stage is considered the closest we can get to the speech of the contemporary Spaniard without resorting to the immense and expensive task of recording natural, spontaneous speech of a large number of informants.

Only questions, whose principal verb (other than a form of ser) was expressed, entered the corpus. This limitation reduced the some 9000 questions encountered, by a little over a third. A procedure and a system of symbols were devised so that the questions could be divided into large syntactical units and the patterns rapidly recognized in a graphic manner. These units are six in number:

Unit	Symbol
1. principal actor	1
2. principal action	2
3. entity modifier outside of the unit whose head it modifies	3
4. action modifier of the principal action (except <u>no</u> , a bound form)	4
5. direct object (except bound forms such as <u>le</u> , <u>me</u> , <u>los</u> , <u>nos</u> , etc.)	5
6. interrogative terms ( <u>qué</u> , <u>cuándo</u> , <u>en dónde</u> , <u>por qué</u> , etc.)	¿

While only twelve patterns were found in the many grammars consulted, the limited corpus of thirty plays provided about one hundred and sixty patterns. This impressive number indicates that there is no over-all pattern to which an interrogative utterance must conform. The descriptions also show that the pattern 2/1 (action/actor) is not necessarily that which is required for a question. It was observed that environment may act as a pressure in the arrangement of units, for unit 2 never appeared in the final position when grouped with three or more units. Unit 2 did not fill the last position when grouped with any two of the units 1, 3, and 5. Examples of units 1 and 4, anterior to unit ¿, were recorded, while there were no cases of units 3 and 5 in such a position. No example turned up where a unit intervened between unit ¿ (quién or qué) and unit 2. Unit 1 and unit 4, however, did appear on rare occasions between unit ¿ (cómo, por qué, and cuándo)

and unit 2. With regard to the word constituents of any unit, other than unit 2, it was noted that those bearing a form of a verb showed a very strong tendency to occupy the final position. Of the ninety-nine patterns which contained a verb-bearing unit (other than unit 2), only nine did not follow this tendency. 184 pages. \$2.40. Mic 56-2276

**THE VERSE DRAMAS OF MAXWELL ANDERSON  
IN THE MODERN THEATRE**

(Publication No. 16,921)

Ronald Crichton Foote, Ph.D.  
Tulane University, 1956

Chairman: Aline Taylor

Maxwell Anderson's verse dramas have generally been viewed by dramatic critics in the context of tragedy. The purpose of this study is to examine Anderson's verse plays primarily in the context of the modern theatre. In his essays Anderson states that in 1930 he broke away from the modern realistic theatre to write poetic tragedy. The nature of the contemporary realism from which Anderson chose to depart is therefore the first problem to be discussed in this study. A survey of the salient events and critical attitudes in the history of the modern theatre serves to delimit the meanings of such terms as "realism" and "naturalism" as they apply to the theatre of the Thirties. From evidence afforded by this material it is apparent that "realism" is a well established orthodoxy of values and procedure in the modern theatre. Compared to other dissenters from the orthodoxy of realism, especially certain British poets, Anderson stands out as the only modern playwright who experimented with a form derived from Elizabethan models, and as the only verse dramatist who has written for the popular commercial theatre throughout his career.

The fact that Anderson set out deliberately to write verse tragedies raises the problem of the nature of his "tragic vision." Like his fellow poets Anderson consciously rejected the values of realism and claimed to accept the values inherent in classical and in Elizabethan tragedy. An analysis of his tragic vision as compared to three basic views of tragedy commonly held today proves that Anderson's idea of tragedy is valid in humanistic terms but is not valid if tragedy appears to involve either a transcendental level of existence, or the kind of Being postulated by the existentialists.

In his essays Anderson explicitly acknowledges Aristotle as his mentor. However, a comparison of the essays with the Poetics reveals fundamental deviations from Aristotelian theory, deviations so basic that it is not surprising to find that Anderson's plays bear a much closer affinity to those of the Elizabethans than to those of the Greeks. Although in the essays Anderson nowhere gives his reasons for copying the Elizabethans, a detailed examination of his verse plays shows that he attempted to adapt to the proscenium stage the conventions which accorded with the conditions of the Elizabethan platform stage. Further, an analysis of his plays shows that Anderson's thought is closer to that of the Elizabethans than to that of the moderns, with the result that in matters of psychology and motivation his

plays are more thoroughly Elizabethan than has been generally supposed.

With his belief that an act of will can create tragic dignity in man, Anderson is necessarily concerned with the effective dramatic expression of the interior events of the human psyche. With respect to the problem of portraying this interior world without unduly disturbing the order of the exterior world, Anderson's use of Elizabethan form compares favorably with realistic and expressionistic solutions to this problem both in consistency of form and in suitability for the popular stage. Thus, although Anderson's tragic vision has been questioned by non-humanistic critics, his contribution to the modern theatre appears to be more significant than has hitherto been supposed.

269 pages. \$3.50. Mic 56-2277

**BILINGUALISM AND THE CREATIVE WRITER  
OF FRENCH CANADA**

(Publication No. 16,935)

Robert Somerville Graham, Ph.D.  
University of Colorado, 1955

Supervisor: Assistant Professor Rodolphe-Louis Hébert

The object of this thesis is to attempt to show the impact of widespread bilingualism on the creative writer and his work.

For this study French Canada has been chosen because it is an area where bilingualism is widespread. It also has a vital and growing literature.

Bilingualism is dealt with in some detail. To examine its causes and effects, other bilingual groups are discussed and certain conclusions are reached that apply to French Canada as well as to other areas.

The aspect of creative writing that is dealt with here is the modern novel. As it is the genre that best projects the life of the group, it is the genre that is most likely to be affected by close contact with life.

Some sixteen writers are dealt with. Among them are some of the best creative writers in French Canada. The novels themselves, numbering twenty, deal with 1) the urban working class, 2) the urban middle class, 3) rural life and 4) one war novel.

Thus, by examining novels dealing with all the phases of French Canadian life, it will be possible to determine whether the impact of English-speaking North America and its language is found in all the environments projected in the novels, or whether certain environments are more affected than others.

In the twenty novels dealt with, there is often wide divergence from one to another in the matter of loan words, calques and English influences on syntax. As the novel is an artistic form of the language, the writer can do with it what he will. He can eliminate the foreign influences that permeate the environment if he so wishes. Whether he conscientiously does this or not would depend on his attitude to his mother tongue and to the other language. As he is a member of a group engaged in defending its language, the chances are that he will not allow his style to be unduly influenced by English. For this reason, the presence of any English influences in his syntax is highly significant.

There is also the matter of loan words to be taken into account. As French Canada is entirely separate from France, loan words can enter its vocabulary with greater ease because of its dependence to a large extent on the English-speaking world.

Many new concepts have come into French Canada from Anglo-America. The writer's attitude and use of these is highly important because they can affect his literary style. Examples of this are given.

The conclusion is that the French Canadian creative writer is influenced by the bilingualism of his environment. This in itself is neither good nor bad. However, since the standard language is that of European France, European French usage is the norm. The writer thus encounters considerable difficulty in having to conform strictly to the rules that govern the grammar, syntax and vocabulary of the literary language. This discrepancy between Europe and America is to be expected, but the presence of widespread bilingualism in the area tends to make the handling of the literary language much more difficult. Bilingualism, then, has an adverse effect on the literature of the area. The only solution would be the reestablishment of unilingualism.

235 pages. \$3.05. Mic 56-2278

#### THE POETRY OF STEPHEN CRANE

(Publication No. 17,058)

Daniel G. Hoffman, Ph.D.  
Columbia University, 1956

Stephen Crane's verse has been praised by other poets, and literary historians have acknowledged that it initiates or foreshadows general tendencies in twentieth-century verse. Yet Crane's proper place in poetic tradition has remained curiously indeterminate. The acquisition by the Columbia University Library of a large collection of new Crane materials provides an opportunity for attempting to define Crane's position as a poet and his sensibility.

Crane's work is an extreme expression of the sensibility of isolation, a characteristic theme in American writing. His sense of man's aloneness in a hostile universe has its sources both in the political and religious egalitarianism of his cultural background and in his own personality. New evidence tends to confirm John Berryman's hypothesis that Crane's psychic make-up is described by Freud in "A Special Choice of Type of Objects Made by Men." Yet in Crane the sense of isolation is opposed by a counter-principle of willed involvement in society. This takes the form of sacrificial heroism.

Although Crane was by chance or choice remote from most of the culturally important sources of metaphor on which literature depends, his religious heritage proves to be an important influence upon his thought and art. His work reflects the conflict between the Calvinistic bias of his mother and her family (as expressed by his great-uncle, the Methodist Bishop Jesse T. Peck, in What Must I Do to be Saved?), and the Arminian humanism of his father, Jonathan Townley Crane (in Holiness the Birth-right of All God's Children).

Crane's love poetry tends to confirm the Freudian view Berryman proposes, but at the same time it reflects the importance to Crane's imagination of the religious culture

from which he was struggling to free himself. Images of menace, violence, predation, courage, and loyalty characteristically appear in erotic contexts; these indicate Crane's linkage of love with violence, war, death, sin, and doom. There are surprisingly few poems on war itself; most of these are new. "The Blue Battalions" brings together most of Crane's significant themes and reflects his dual heritage from martial and religious forebears. The verse dealing with economic injustice hardly suggests Crane's eminence in naturalistic fiction.

In the 1890's Crane was thought to be a decadent or a symbolist. Later critics saw him as an imagist in advance of that movement or as a nonpareil, a unique phenomenon without literary antecedents or followers. Crane in fact developed several styles and methods of structure to replace the conventions he repudiated. Parables from the Bible and his family's religious tracts and sermons, and the allegories in Olive Schreiner's Dreams and Ambrose Bierce's Fantastic Fables were important early influences. Only one poem is directly traceable to Emily Dickinson; another derives from Longfellow. Although Crane is often compared to Whitman the actual debt seems slight. The limitations of Crane's imaginative commitment appears in comparing their metaphors of death; for Crane, death is a terminus, not an entrance to the renewal of life nor, as in Dickinson, a conferral of status. Death provides a wider range of metaphor in Crane's prose, where he envisages the fellowship of suffering, of fear, or of courage, rather than the absolute aloneness of his verse. Although Crane resembles the French symbolists in his alienation from society, in his attack on poetic convention, and in his demonstrable assumption of the essentiality of artistic form, he has no direct connection with that movement. His aesthetic appears to derive instead from the American symbolist tradition formulated by Emerson and Whitman. Crane's progress from allegory toward symbolism resembles that of Hawthorne and Melville.

Despite his having anticipated imagism in some respects, Crane had little influence upon later verse. His work was hardly known until 1926; his commitment to brevity, allegory, and narrative run counter to prevailing poetic assumptions although his nondiscursive presentation resembles them. His influence was strong upon Hemingway, whose early verse is modelled on Crane's and whose sensibility resembles Crane's in important respects. In his verse Crane explored the menaced condition of man in isolation; he developed new techniques, and he made available to poetic expression a further reach of imaginative experience - narrow though it be - than had any writer before him.

338 pages. \$4.35. Mic 56-2279

#### THE WRITING OF HENRY D. THOREAU'S A WEEK ON THE CONCORD AND MERRIMACK RIVERS: A STUDY IN TEXTUAL MATERIALS AND TECHNIQUE

(Publication No. 17,205)

Carl Frederick Hovde, Ph.D.  
Princeton University, 1956

Through description and analysis of the textual materials remaining from the writing of A Week on the Concord and Merrimack Rivers (amounting to approximately

three thousand pages), an attempt is made to show that the book is not the arbitrary collection of descriptions, *pensées*, and quotations which it has often been considered, but is, despite its shortcomings, a unified work of art which was carefully wrought.

Thoreau's basic materials for A Week, as for Walden, were his Journal entries, whose brevity and self-contained character were in keeping with the stress he placed upon insight as something transitory. His constant revision of individual passages was an attempt to give perfect expression to what he had seen of the realm of spirit, the source of truth. Thoreau was aware of the difficulty of making these Journal entries serve a proper function in a larger work. Yet many passages, written years apart, could be joined because his mind returned again and again to many of the themes contained in A Week. Often, however, he was obliged to eliminate local references in his original reflections. He rewrote constantly, achieving economical form, and often introduced figures and symbols more in keeping with the book.

In making quotations from poetry, from Eastern religious works, and from histories of New England, Thoreau again shows his power to unify diverse materials. His decision not to identify poetic citations was just both to himself and to the poets, for he made the lines his own, sometimes giving them a meaning radically different from that which they had in the original works. In examining Thoreau's quotations from poetry and from Eastern works, what he chose to ignore is often more illuminating than what he borrowed. He took from works of New England history the anecdotes, the "asides," best fitted to bring alive the landscape through which his journey was made. He made mythical figures out of local heroes; when he compares them to their classical predecessors, a seriousness shines through the lightness of his tone.

The state of the extant manuscript drafts of A Week shows much about Thoreau's workmanship, for most of the confusion is the direct result of his methods. It seems certain that there was never more than one "complete" draft of A Week at any one time, a likelihood which makes it difficult to place the remaining manuscripts in chronological order. The changes in these manuscripts reveal Thoreau's efforts to achieve proper balance of incident and reflection in the finished work. In the final version, all the people described have a moral function, and in the manuscripts Thoreau omitted anecdotes which were merely amusing, or which duplicated the "point" of stories which he preferred to keep. He of course revised, rather than eliminated, many passages of description and meditation to achieve strong effects with maximum economy.

Thoreau was not satisfied with revising the work in manuscript. He continued to work on the text even after it had been set in type at his own expense, making many, though minor, changes in the page proof for the first edition, only a small number of these being corrections of compositor's errors. Collation of the first edition with the true second edition shows that Thoreau again made many minor textual changes in preparation for a new edition which was not to appear until four years after his death. He continued to improve his language, and added several reflections.

All of the remaining materials demonstrate a careful craftsmanship which belies the accusations of carelessness and lack of form so frequently brought against A Week.

316 pages. \$4.05. Mic 56-2280

#### GEORGE ELIOT AND ITALY: A COMPREHENSIVE STUDY OF ROMOLA

(Publication No. 16,719)

John Amos Huzzard, Ph.D.  
The Pennsylvania State University, 1956

This dissertation investigates the origins of George Eliot's interest in Italy, her methods of research, her theory of the historical novel, her handling of Italian characters, and the effect her studies in the Italian Renaissance had upon her intellectual and creative faculties; in addition, there is an investigation of the critical reputation of the novel, covering the years 1863 to the present.

George Eliot saw Italy briefly as a young girl. Her first real visit occurred in 1860, when she went with Lewes for the avowed purpose of absorbing culture. While in Florence, she decided to write a novel about that city, using Savonarola as a chief character. From her letters and her journal, it would appear that her love for Italy was immediate and profound.

One year later she and Lewes were back in Florence to gather material for her novel. She had been from girlhood an omnivorous reader of learned books, but this was her first experience in working with the materials of research. She consulted histories, manuscripts, old maps, and miscellaneous books of curious and obscure information in her diligent search for facts pertaining to Florence as it looked in the last decade of the fifteenth century. Unfortunately, she neglected to study Italian life at first hand, depending almost solely on books and museums.

Her enormous task, however, was undertaken with a definite purpose in mind. Her theory of the historical novel called for an infinitely detailed description of the setting as it appeared to the characters in the period covered in the pages of the novel. Of course, her novels of English life have the same regard for detail, but, for them the author did not find it necessary to consult medieval chronicles in order to learn how peasants spoke or dressed in bygone ages. In writing her historical novel, she followed the example of Bulwer-Lytton, eschewing the less scientific methods employed by Scott and his successors.

She had great difficulty in getting her characters to act and speak like Italians, especially Romola, whom George Eliot patterned after herself. Her general plan for handling the principal characters - Romola and Tito - was to draw them first from the inside and then place them in the midst of their surroundings. The plot demanded that Savonarola first be seen from a respectful distance, so George Eliot started from the outside and gradually worked inward. Eventually, all three blend with the setting that the author has so painstakingly reproduced for them. Her minor characters are always portrayed in close association with their background, for only by this device can the author make her tradesmen, vendors, idlers, gossips, artists, diplomats, and scholars come to life in her pages.

The final chapter seeks to prove that Romola had a significant effect upon her later fiction. In Middlemarch the author reveals the impact of Italy upon the mind and sensitivity of a young provincial girl. Her maturity is reflected in the later novels. In each of them there is a more sophisticated approach to life and a far more sympathetic attitude toward human frailty than was evident in the novels preceding Romola. Her technique in the later

novels shows unmistakably the influence of Romola. For example, the portrait of Lydgate, in Middlemarch, would not be complete without the detailed description of the state of the medical profession in England in the early nineteenth century.

## VITA

John Amos Huzzard was born on August 8, 1918, in York, Pennsylvania. He graduated from William Penn Senior High School, York, in 1936. He has a B.S. degree from Millersville State Teachers College, Millersville, Pennsylvania. In 1941-42 he worked for the Ford Electric Company, Arlington, Virginia. He served in the United States Army from 1943 to 1946. He received his M.A. degree from New York University in 1949 and taught English at the University of Scranton from 1947 to 1950. He teaches English Composition at The Pennsylvania State University, where he received his degree of Doctor of Philosophy in 1956. 231 pages. \$2.89. Mic 56-2281

**THE IDEA OF THE NOVEL IN FRANCE:  
THE CRITICAL REACTION, 1815-1848**

(Publication No. 17,060)

Marguerite May Iknayan, Ph.D.  
Columbia University, 1956

This dissertation seeks to define the critical attitudes held and the criteria applied to the novel as a genre at a time when a new undogmatic criticism had to cope with an enormous development in the genre. Most of the source material comes from the periodical press. During this period, critical articles became more numerous, longer, and more specific.

The Classic-Romantic struggle of the 1820's was little concerned with the novel, which had no place in the hierarchy of genres and no accepted poetics. After 1830, the novel, which had gained considerable prestige since 1815, moved into the center of discussion of diverse literary questions. The upward trend reached its peak in the early 1830's, and the subsequent decline of status of the novel was hastened by the advent of the roman-feuilleton.

Continuing tradition was manifested early in the period by emphasis on utility and verisimilitude and the lasting popularity of Gil Blas. At the same time, the novel was considered the expression par excellence of society, hence open to change. The link between novel and society, axiomatic until 1830, was often thereafter disputed or accepted with reservations.

A dominant factor in the novel's expansion and rise in prestige in the early Restoration was the vogue of Walter Scott, who popularized not only historical subject matter, but a dramatic method of presentation, plus local color and description of customs. After his vogue passed, the impetus he had given the genre continued.

By the early 1830's, the novel had broadened to include any subject, real or fantastic; it had replaced the epic, engulfed drama, and could contain digressions on all manner of questions, social, political, and religious. But soon after 1830 the critical reaction set in against grandiose

tableaux in favor of a smaller scale novel with greater emphasis on psychological depiction. The dramatic novel was still in good repute, provided it was held within reasonable limits. Analysis, out of favor before 1830, was now approved, though it should not produce a static, plotless work. The novel, based on observation, was to lie between the two extremes.

The utilitarian value of the novel, which had traditionally lent it prestige, was maintained in the educational possibilities of the historical novel, and further emphasized in the social novel, which flourished during the July Monarchy. After the early 1830's, however, the critical reaction against the openly utilitarian was strong. At the same time, most critics also disapproved the doctrine of l'art pour l'art and kept to the middle position of advocating a novel based on a serious idea implicitly expressed.

The historical novel, a new type, rose spectacularly and declined; the analytical novel, neglected during the Restoration, returned after 1830; the adventure novel found fruition in the roman-feuilleton, often joined to the social novel; the roman de moeurs, after a rather slow departure under the Restoration, saw immense development after 1830. Types often fused and were seldom clearly defined by the critics.

In the middle 1820's, the critics began to pay increasing attention to the great technical advances evident in contemporary novels. Soon they were expecting any novelist to display technical skill in integrating characters, action, and setting in a cohesive whole, usually on a dramatic model, by means of narration, description, and dialogue. Style, considered of minor importance in 1820, became the subject of considerable censure in the 1830's from critics impatient of inflated writing. Though technical advances were welcomed, they were not accepted as a substitute for psychological values, and novelists were constantly admonished against trying to hide poverty of content under superficial attainments in form.

427 pages. \$5.45. Mic 56-2282

**THE LIFE AND WORKS OF ANGEL DE CAMPO**

(Publication No. 16,940)

Paul Courtney McRill, Ph.D.  
University of Colorado, 1955

Supervisor: Professor Ralph Warner

Angel de Campo (1868-1908) was a well-known Mexican author during his lifetime. Nowadays there is little critical notice of his works, few of which are readily available. There has been no comprehensive study of his writings and no thorough biography of the man. This study was undertaken to remedy those lacks, to provide information about the greater part of his works, which have never been published in book form, and to determine the rightful position of the author in the history of Mexican literature.

Campo led a difficult life, for he and his brother and sisters were orphaned at an early age, and Angel assumed the duties of caring for the other children. He was able to do this by writing for newspapers and magazines, working for a government bureau, and teaching. His own marriage was delayed until after his three charges were married

and established. After his marriage in 1904 he continued to write and work for the government until his death in 1908.

The earliest published works of Campo, written in the eighties, had little merit. These predominantly romantic works were published in the official organ of the Liceo Mexicano, of which Campo was a founder. In the early nineties, a great many stories, sketches and articles of better quality were printed in the columns of El nacional. Some of these were edited in book form with the titles Ocios y apuntes (1890) and Cosas vistas (1894). Campo's best stories appeared in the Revista azul in the mid-nineties and were collected in Cartones (1897). The author had achieved, to a great extent, the realism which he desired. His best work came after 1899, when he abandoned the pursuit of fictional realism and used the genre most suited to his talents, the humorous article or moral essay, or a combination of the two. These articles, the Semanas alegres, appeared weekly in El imparcial until Campo's death. They treated a variety of subjects, being mostly concerned with Mexican customs and institutions, and consistently evinced love and compassion for the lower classes of Mexico. The quality of these essays entitle the author to consideration as Mexico's foremost humorist and cotumbrista, and the moral attitudes and opinions displayed in them show Campo to be the greatest champion of the Mexican people and a forerunner of the revolution of 1910.

126 pages. \$1.70. Mic 56-2283

and destructive in force, and where the structure of Medieval society is taken as symbolic of social oneness; in the religious order, where evaluation of religion is made in terms of the indivisibility of its body of doctrine and the oneness and solidarity of its membership; in the aesthetic order, where his concept of poetry reposes on the fusion implicit in the process of analogy and explicit in the metaphor, as well as upon the linking, unifying force of the symbol, and where the idea of totality serves as criterion in his judgment of the artistic creation of others, and the mark of unity seals his own message.

In Chapter Three, we shall study Claudel's vision of man's integration into the universal harmony in the mystical union. Recognizing the place or mission of each individual in the overall plan, Claudel recommends an attitude of constant interior listening for the revelation of one's vocation so that the individual may not jar the universal accord ("Ne impedi muscam"). The first step in the direction of the fusion of the human with the Divine will is the irremediable dissatisfaction with the finite; then begins the task of liberation from worldly attachments, freeing the will of the creature for union with that of the Creator, at which moment the ideal harmony exists.

The conclusion drawn from this study is that, in the Claudelian vision of reality, (1) order and unity are everywhere present in creation as it comes from the hand of God, (2) order and unity are the supreme good in the direction of human affairs, (3) man integrates himself into the universal harmony in the mystical union.

205 pages. \$2.70. Mic 56-2284

#### THE CONCEPT OF UNIVERSAL HARMONY IN THE WORK OF PAUL CLAUDEL

(Publication No. 17,069)

Catherine Rita Martin, Ph.D.  
Columbia University, 1956

The purpose of this study is to attempt to demonstrate that the concept of universal harmony is central in Paul Claudel's interpretation of the universe.

Chapter One will show his recognition of order as a universal property of being, as the supreme good; the meaning of order, or more specifically of harmony, as he envisions it in the theory of co-naissance; his constant preoccupation with totality; the composition of the whole as he envisions it, made up of the visible and the Invisible; the establishing of the proportion of the one to the other; the considerations of the evil and imbalance (particularly as they appear in modern life) resulting from the denial of the Center; his recommendations for the reestablishment of universal harmony by restoring the Center and cementing the parts through the cohesive bond of charity.

Chapter Two will endeavor to examine Claudel's application of the concept of harmony in his interpretation of the various spheres of activity in which man exists: in the cosmic order where he beholds the simultaneity of the elements of the full universe existing interdependently before him; in the philosophical order, where he constantly pursues the search for bases of reality and where Thomistic concepts of order and unity occur with great frequency; in the political order, where the monarchy is held as symbolic of political unity; in the social and economic sphere, where revolution is treated as separative

#### THOREAU AND THE ECONOMIC ORDER: THE LATER YEARS

(Publication No. 17,083)

Leo Stoller, Ph.D.  
Columbia University, 1956

At Walden Pond, Thoreau tried to point the way to a social order in which all of a man's activities could contribute to his self-culture. Believing that this highest aim of life was inconsistent with acquisition and with production for the market, he projected an economy of handicrafts and subsistence agriculture. But he made no effort to transform the industrializing America of his day directly. Instead, following the transcendentalist concept of social action, he sought to provide it with a model by making his own life a microcosm of the ideal. His experiment failed. Instead of showing the practicability of the subsistence homestead, Thoreau only demonstrated that a determined man could live on the smallest plot if he were close enough to town to supplement the income from his cash crop with wages. His theory of action, tested in the antislavery movement, failed too, leading to acts which symbolized the internal freedom of Thoreau's microcosm but had no effect on slaveowners or their northern supporters. In a similar way, his relation to nature failed to maintain the union of the physical and spiritual which was part of his ideal and became limnology and other scientific studies which served the developing industrial economy.

After Thoreau returned to Concord, he accepted the existing social order by becoming a surveyor, an instru-

ment to certify ownership in transactions aimed at making money. But he continued to denounce the life to which he had thus resigned himself and to seek new foundations for an ideal life in his soul and in the natural world which he took for its symbol. This search yielded only a metaphorical representation of the Walden experiment and the realization that he could no longer attain correspondence with nature. But while his life was being thus polarized, Thoreau began to look for ways in which the ideal of self-culture could be combined with the existing economy.

His discoveries in silviculture taught men the most profitable method of managing woodlots. But as this method was based on a natural succession of one type of growth by another, it was also the one most likely to preserve the forest itself from extinction and to make it available to men for higher uses than profit. Complementing his silviculture was Thoreau's advocacy of conservation. In both fields he came to advocate governmental restriction of the acquisitions of individuals in the interest of making nature available to all for spiritual ends.

In thinking about the simple life, Thoreau succeeded in separating its ideals from the pre-industrial economic foundation on which they had rested at Walden. He also began to accept factory production as unavoidable necessity. But he did not discover how to combine the ideals of simplicity with the productive methods of a complex society. The recognition that men could not establish an ideal society within a short time led Thoreau toward a more conventional belief in the reform of existing evils. Here too he learned that his ends required governmental control of individual economic activity.

But neither in relation to industry nor to agriculture and conservation did he reach participation in politics, for of all the aspects of his social thought, his concept of social action was the least responsive to the demands of the day. He defended John Brown as a man who attacked evil directly, but except in his occasional aid to fugitive slaves and to Brown's associates after the raid on Harper's Ferry, Thoreau took no step that would have brought him closer to the martyr whom he celebrated. He did, however, support the federal government in the Civil War.

217 pages. \$2.85. Mic 56-2285

#### THE RISE OF HIGHER CRITICISM IN ENGLAND, 1800-1870

(Publication No. 17,085)

James Robert Thrane, Ph.D.  
Columbia University, 1956

The impact of science on the Victorian mind was not due solely to Darwin's "new biology"; an equally potent force was Higher Criticism, as the critical study of the text, character and origins of Biblical documents is called. English Higher Criticism did not begin in 1860, as is widely believed, and one object of this study is to show that Essays and Reviews should instead be regarded as the culmination of a movement that reached back to the beginning of the nineteenth century. My overall purpose is to outline Higher Criticism's Continental origins and then to trace in some detail its frequently stormy progress in England, both as an independent science and as a shaping

force in Victorian literature and opinion.

Among the "causes" of Biblical criticism in seventeenth-century Europe were the confidence which men felt in their ability to solve any problem through the newly-emerged inductive method; the new attitudes toward ancient history, which in turn were influenced by the vast growth of men's knowledge of non-Christian religions; and the ever-increasing demand for a firmer basis of religious authority than articles and creeds could furnish. As early as 1678 Simon laid down the principle that the higher critic must disregard theological presuppositions and everything that is irrelevant to his goal of establishing a passage's meaning. Churchmen readily apprehended dangers to traditional faith in this naturalistic principle, but Protestant orthodoxy as a whole lacked the philosophical basis required for an adequate reply.

Astruc and other pioneers did invaluable work, but Higher Criticism could never have advanced beyond the textual stage without the historical method which, as developed by Herder, interprets history as continuous growth and seeks to re-create the past through a synthesis of imagination with research. This method facilitated the steady progress of Old Testament studies from Eichhorn's day on; but both tradition and Schleiermacher's intensely subjective theology held men back from applying scientific methods to the gospels. In the early nineteenth century the lead in this area was taken first by the "rationalistic" exegesis of Paulus' school, and later by Strauss and other philosopher-critics whose Hegelian Idealism furnished them with brilliant insights but also led them to warp history into conformity with philosophical systems.

Early English Higher Criticism was not led astray by philosophy, but the conservatism which preserved it from the Tübingen critics' aberrations sometimes blinded it to the value of the historical method. Theology in this period was committed to an obsolete apologetic and the verbal inerrancy of Scripture. Before criticism could develop, Marsh and Thirlwall, with Coleridge, Davison and Thomas Arnold, had to prepare the way by bringing about a better understanding of inspiration and prophecy. Milman's History of the Jews (1829), Hare's translation of Niebuhr (1828), and Hennell's study of Christian origins (1838) gave valuable methods and results; and George Eliot's translation of Strauss (1846) made it plain to Froude, Clough and other thoughtful men that the century of Higher Criticism had begun. Most churchmen continued to see in criticism only a new form of "infidelity" to be ignored or suppressed, but within the Church there were also men who believed that Christianity's precious truth must be separated from its unessential matrix; and from these men came the Essays and Reviews group, whose critically unimportant volume established the clergy's right to freedom of inquiry. Almost simultaneously, Colenso began to publish his study of Pentateuchal origins, England's first enduring contribution to Old Testament scholarship, and the Cambridge scholars inaugurated England's critical school. Many struggles lay ahead, but Higher Criticism was now acclimatized in England.

679 pages. \$8.60. Mic 56-2286

## THE ETHICS OF JOSEPH CONRAD

(Publication No. 16,948)

John Riley Warner, Ph.D.  
University of Colorado, 1955

Supervisor: Professor Leslie L. Lewis

This dissertation seeks to prove that the writer Joseph Conrad was above all else an ethicist who dealt almost exclusively in his works with ethical problems, and that his preoccupation with ethics determined his choice of material, directed his plots, and even decided his technique. Conrad believed that "every subject in the region of intellect and emotion must have a morality of its own if it is treated at all sincerely; and even the most artful of writers will give himself (and his morality) away in about every third sentence" ("Author's Note" to Chance, pp. xi-xii). Believing that the usually accepted standards of mankind were wrong because founded upon desire and expediency rather than upon truth, and not accepting any religious creed, Conrad formed his own code, neither new nor unusual, to which he held with formidable tenacity. He believed that man was located, for no apparent reason, in a nonethical universe, in a world with other men; therefore, man should discover the best possible way to live with himself and with others. Consequently, Conrad devised one of his most basic concepts, the complex idea of Solidarity, usually stated as "one of us." Whatever enforced Solidarity was good; whatever weakened or destroyed it was bad. Almost every one of Conrad's ethical concepts was conceived as a support to Solidarity. Fidelity (chiefly loyalty to one's principles), Duty (obligation or responsibility which keeps a man up to the mark), Conscience (the feeling which arises when one falls short of the Ideal), the Idée Fixe (an obsession), the Fall of Man (not a religious concept but rather an expression of Conrad's view of man's state when the ethical code is violated), Choice (never entirely free) and Chance (often explainable, but just as often inexplicable), Good and Evil (frequently order and chaos, or truth and error), Morality (the usually erroneous standards set up by society) and Ethics (the standards set up by the individual and based upon truth), Playing the Game, Tolerance, and Courage--these are Conrad's answers to how a man achieves Solidarity, to how he should live his life. He formulated his code as a result of his racial and family background, his experiences as a child and as a seaman, his temperament, and his reflections on life and its problems. His technique (notable first for his use of a narrator, primarily Marlow, and second for his use of indirection) was largely the result of his being an intuitive writer. It indicates most obviously a two-fold purpose: the narrator is Conrad's ethical guide for the reader, and the indirection serves to de-emphasize what happens and to emphasize how it happens, so that the reader will hesitate in making up his mind and in judging man and his actions. Though believing that there are no final answers and therefore that man should be tolerant, Conrad was primarily concerned with finding truer ethical values.

A chapter has been devoted to each of Conrad's major ethical concepts. In these chapters are brought together statements and examples, drawn from Conrad's novels and stories, his critical and personal essays, and his letters, to illustrate the importance of these ideas to Conrad and to the reader seeking to understand his works.

208 pages. \$2.70. Mic 56-2287

## JOSE JUAN TABLADA; MEXICAN POET, (1871-1945)

(Publication No. 17,089)

Howard Thomas Young, Ph.D.  
Columbia University, 1956

This is a critical study of the life and works of José Juan Tablada, a Mexican poet who flourished during modernism in Latin America, but who continued on under other auspices.

He was born in Mexico City, educated there, and lived most of his adult life in New York where he made a living by sending newspaper articles back to Mexico.

His early poetry shows the influence of Baudelaire and the parnassians. The present study indicates that Baudelaire's influence on him has been greatly overrated. An analysis of the early poems proves that neither the subject matter nor the tone of Baudelaire was very deeply assimilated. Where Baudelaire was concrete, Tablada was vague; where the former created a real feeling of evil, the latter only hinted at it. Instead, the parnassian manner and style dominate in Tablada's first two volumes: El florilegio (1904) and Al sol y bajo la luna (1918).

During middle age, he began to write Japanese haikai, and introduced the form into Hispanic verse. Un día (1919) and El jarro de flores (1922) are two volumes of haikai. Compared with the rest of his production, these poems are outstanding, and his experiment was influential in causing other Mexican and Latin American writers to adopt the form.

Li-Po y otros poemas (1920) is a collection of ideographic verse, written under the influence of Apollinaire's Calligrammes. It is an attempt to add a visual element to poetry by arranging the lines in a representational manner. In the case of Tablada, it resulted in inferior verse.

The final stage of his poetry represents a return to native influence. La feria (1928) is a successful volume of poems of Mexican theme, written under the aegis of Lopez Velarde.

As a prose writer, Tablada was an untiring journalist. He wrote numerous columns about Paris, Japan, and life in New York in tightly constructed, colorful prose. He was also an impressionistic art critic, and his Historia del arte mexicano (1927) is sensitive if uncritical. A novel, La resurrección de los ídolos (1924), a volume of memoirs, and several political pamphlets comprise the rest of his prose.

On the whole, his poetry is second rate. Interest in him is centered in the faithful way he mirrored the poetical currents of his time, and, by studying him, one can better understand these currents. He refused to be typed, and changed his style frequently. As a result, his greatest role was that of innovator. His most persistent theme was l'amour maudit, expressed with varying degrees of eroticism and a sense of sin. Occasionally, this main theme rises to the level of considering the ancient dichotomy of body and soul, especially when in later life he became interested in theosophy. His chief fault was rhetoricism, which he himself realized and successfully corrected with his haikai.

A neglected aspect of his life is the work of love he carried on in propagandizing Mexican art while living in New York. As the result of numerous articles in English on Diego Rivera and José Clemente Orozco, he aided in

popularizing Mexican painting in this country. He was a personal friend of these and other painters, and his residence in New York afforded him the opportunity of helping them in many ways.

As a poet, his influence has not been great, but as a defender of all new art he attracted many young Mexicans, who paid him the tribute of considering him to be eternally youthful.  
317 pages. \$4.10. Mic 56-2288

## MATHEMATICS

LIE SIMPLICITY OF A SPECIAL CLASS  
OF ASSOCIATIVE RINGS

(Publication No. 17,210)

Willard E. Baxter, Ph.D.  
University of Pennsylvania, 1956

Supervisor: Dr. I. N. Herstein

Let  $A$  be a simple associative ring. One can, by defining a new multiplication, render  $A$  into a Lie ring; such a multiplication is defined by  $[a,b] = ab - ba$ . One denotes by  $[A,A]$  the additive subgroup generated by all elements of form  $ab - ba$ ,  $a$  and  $b$  in  $A$ . An additive subgroup of  $U$  of  $[A,A]$  is said to be a Lie ideal of  $[A,A]$  if, in addition,  $ua - au \in U$  for all  $u \in U$  and  $a \in [A,A]$ . It is proved in the first chapter of this thesis that if  $A$  is a simple ring of characteristic 2 or 3 and  $U$  is a proper Lie ideal of  $[A,A]$ , then  $U$  is contained in the center of  $A$ , except for the case where  $A$  is of characteristic 2 and 4-dimensional over its center, a field of characteristic 2.

This result is then applied to show that if  $A$  is a central simple algebra not a division algebra over a field  $F \neq G.F.(2)$  with descending chain conditions on left ideals, then the only invariant subspaces of  $A$  are  $(0)$ ,  $F$ ,  $A$ ,  $[A,A]$ , and possibly subspaces containing  $[A,A]$ , with the exception in the case in which  $A$  is 4-dimensional over  $G.F.(2)$ .

In the second chapter of this thesis, simple rings with involution are studied. A ring  $A$  is said to have an involution defined on it if there exists a mapping of  $A$  onto  $A$  defined by  $a \rightarrow a^*$ , for all  $a \in A$ , such that i)  $(a^*)^* = a$ ; ii)  $(a + b)^* = a^* + b^*$ ; iii)  $(ab)^* = b^*a^*$ . Of special interest is the set  $K = \{k \in A \mid k = -k\}$ , the set of skew elements of  $A$ . If  $k$  and  $l$  are in  $K$ , then  $kl - lk$  is again in  $K$ . Therefore,  $K$  is a Lie ring. One denotes by  $[K,K]$  the additive subgroup of  $K$  generated by all elements of the form  $kl - lk$ ,  $k$  and  $l \in K$ . An additive subgroup  $U$  of  $[K,K]$  is said to be a Lie ideal of  $[K,K]$  if, in addition,  $uk - ku \in U$  for all  $u \in U$  and  $k \in [K,K]$ .

In this chapter it is proved that if  $A$  is a simple ring of characteristic different from 2 with either its center  $Z = (0)$  or of dimension greater than 16 over  $Z$ , and such that  $A$  has an involution defined on it, then every proper Lie ideal of  $[K,K]$  is contained in  $Z$ .

Some interesting relations between  $K$  and  $S = \{x \in A \mid x^* = x\}$  are also proved. For instance, it is shown that if  $A$  is as above, then every element of  $S$  can be written as the sum of squares of elements of  $K$  with coefficients  $\pm 1$ .

53 pages. \$1.50. Mic 56-2289

## SEMI-TOPOLOGICAL LINEAR ALGEBRAS

(Publication No. 17,418)

Charles Francis Briggs, Ph.D.  
University of Michigan, 1956

This is a study of a class of algebras related to the algebra of all continuous complex-valued functions over a completely regular topological space, under the uniform topology, designated as locally-normed algebras. A locally-normed algebra  $A$  is an algebra over the complex numbers which is a topological group, and in which the component of  $O$  is a Banach subalgebra, open and closed in  $A$ . Such an algebra is not topological, since in general among the fundamental algebraic operations (addition, multiplication in the ring, multiplication by scalars, and inversion) only addition is assumed to be continuous. An involution (\*) is required in most of the work, with the usual non-topological properties of (\*) applying to all of  $A$ , and the topological properties applying to the component of  $O$ .

In such an algebra, the closed maximal ideals assume the role of major importance, and in the commutative case the quotient algebra modulo such an ideal is shown to be isomorphic to the complex numbers if  $(xx^* + e)^{-1}$  is in the component of  $O$ . Thus, if such an algebra is regularly semi-simple (the intersection of the closed maximal ideals is  $O$ ) it may be represented as an algebra of continuous functions over its set  $M$  of closed maximal ideals. In this equivalence bounded functions correspond to elements in the component of  $O$ , unbounded functions to elements not in this component. The set of closed maximal ideals may be embedded in 1-1 fashion in the space of maximal ideals of the component of  $O$ . This component is a commutative Banach algebra, and its set  $\bar{M}$  of maximal ideals is known to be a compact space. If  $\bar{M}$  is the Cech compactification of  $M$ , and if every element of  $A$  is either regular or is in a closed maximal ideal, then  $A$  is equivalent to the algebra of all continuous functions on  $A$ . Conditions on  $A$  are also obtained under which  $M$  is locally compact.

The space  $M$  has its topological character determined by  $A$ , and is referred to as a  $Q'$ -space. A  $Q'$ -space is a completely regular space  $X$  over which there exists a closed (\*) subalgebra of  $O(X)$  under the uniform topology closed under formation of inverses of non-zero functions for which each closed maximal ideal corresponds to a point of  $X$ .

In chapter 4 the non-commutative case is treated. If  $A$  is a locally normed \*-algebra with  $(xx^* + e)^{-1}$  in the component of  $O$ , and if every element is either regular or contained in a closed maximal ideal then  $A$  is shown to be

equivalent to an algebra of linear transformations defined on a dense subset of a Hilbert space. The bounded transformations correspond to elements in the component of  $O$ , unbounded transformations to elements not in this component.

41 pages. \$1.50. Mic 56-2290

**PLANE ANTI-COLLINEATIONS WITH DISTINCT FIXED OR INTERCHANGING POINTS AND THEIR REPRESENTATION IN FOUR SPACE**

(Publication No. 16,515)

Karl Andrew Johannes, Ph.D.  
University of Pittsburgh, 1956

The purposes of this paper include the following: the development of the forms for use in the investigation of the fixed and interchanging elements, the presentation of means of identifying the different possible types, and the classification of six types of anti-collineations. Other objectives were to derive geometric methods of locating the transformed point  $P'$  of a given point  $P$  in  $C_2$  under a collineation with three fixed points and also under an anti-collineation with three fixed points, and with one fixed point and a pair of interchanging points. Finally methods are presented for locating the transformed point  $P'$  used for the collineation and anti-collineation in  $C_2$ , in the four-space representation of  $C_2$ .

The various forms were derived by requiring that an anti-collineation transform three given points into three other given points. These given points were substituted in the equations of the transformation and three sets of linear systems of equations were obtained. These systems were solved for the nine coefficients of the original transformation. From these the product of three matrices was obtained which when multiplied out gave the matrix of coefficients for the anti-collineation having the given transforms for the given points. Two other forms were acquired by taking the given elements as three distinct fixed points and as one fixed and two interchanging points. These forms were useful in investigating the fixed and interchanging elements of an anti-collineation.

The solution of the linear system also led to the expression of the anti-collineation in determinant form explicitly in terms of the distinct fixed points and in terms of one fixed and two interchanging points.

Using the fact that the product of two anti-collineations is a collineation, and using canonical forms, necessary and sufficient conditions for determining the various fixed and interchanging elements of an anti-collineation and methods of identifying them are presented.

The conventional procedure of classifying the collineation was used to classify corresponding types for the anti-collineation by using the collineation which was acquired from the squared anti-collineation. Six types are presented with their corresponding canonical forms.

A geometric method for locating the transformed point  $P'$  of a point  $P$  under a collineation in the plane of two complex variables, based upon harmonic sets, and results already known for the line of one complex variable, is given.

For the case of the anti-collineation, results known for two distinct fixed points and two interchanging points for

the anti-collineation on the line of one complex variable were extended to the plane of two complex variables. Methods for locating the transform of a point  $P$  under the anti-collineation with three distinct fixed points and with one fixed and two interchanging points are given. These constructions are treated first synthetically, then from the point of view of canonical form, and finally by means of general oblique coordinates.

The geometric methods for both the collineation and anti-collineation are then interpreted in the four-space representation of the plane of two complex variables. Use is made of the fact that the general collineation and anti-collineation transform regular planes into regular planes and a circle-circle transformation is effected in each regular plane.

147 pages. \$1.84. Mic 56-2291

**THE FREE LATTICE GENERATED BY A SET OF CHAINS**

(Publication No. 17,106)

Howard L. Rolf, Ph.D.  
Vanderbilt University, 1956

Supervisor: Professor E. B. Shanks

The purpose of this thesis is to study the free lattice which is generated by a set of unrelated chains and in which bounds of pairs of elements in each chain are preserved.

P. M. Whitman defined an ordering of the set of lattice polynomials generated by a set of unrelated elements, which R. P. Dilworth generalized to apply to the case of lattice polynomials generated by an arbitrary partly ordered set  $P$ . Dilworth proved that his ordering gives a lattice which is isomorphic to the free lattice  $FL(P)$  generated by  $P$  and which preserves bounds of pairs of elements in  $P$ . In the intermediate case, when  $P$  is a set of chains, the definition of Whitman applies provided one minor change is made. This altered definition leads to a significant simplification in the treatment of the case under study, and is equivalent to Dilworth's definition in this case. Necessary and sufficient conditions that two lattice polynomials be related are obtained from this definition.

The structure of two infinite free lattices,  $FL(2+2)$  and  $FL(4+1)$ , are determined; moreover,  $FL(2+2)$  is a sublattice of  $FL(4+1)$ . It is shown that  $FL(n_1 + n_2)$ ,  $n_1 \geq 3$  and  $n_2 \geq 2$ , or  $n_1 \geq 5$  and  $n_2 \geq 1$ , contains a sublattice isomorphic to  $FL(1+1+1)$ . Also,  $FL(1+1+1)$  contains a sublattice isomorphic to  $FL(n_1 + n_2 + \dots + n_m)$ . Covering relations for certain elements of  $FL(n_1 + n_2 + \dots + n_m)$  are determined.

Every infinite free lattice generated by a set of chains contains an infinite subset which order-converges. This answers the question posed by Whitman, "Does any infinite subset of  $FL(1+1+\dots+1)$  order-converge?"

The free modular lattice is studied briefly.

88 pages. \$1.50. Mic 56-2292

SOME INEQUALITIES FOR AXIALLY-SYMMETRIC  
POTENTIAL FUNCTIONS

(Publication No. 16,661)

Melvin Aaron Shader, Ph.D.  
Syracuse University, 1954

Adviser: Charles Loewner

In a recent paper<sup>1</sup> C. Loewner used a notion of general conservation laws and a concept of strongly elliptic mappings in order to obtain inequalities relating some of the flow variables along the boundary of a two-dimensional subsonic flow region. In this paper some of these ideas are applied to situations which give rise to axially-symmetric potential functions.

The basic equations describing the steady irrotational axially-symmetric flow of an inviscid incompressible fluid are

$$(1) \quad \begin{aligned} u_r - v_x &= 0 \\ (ru)_x + (rv)_r &= 0, \end{aligned}$$

where  $(x, r)$  are cartesian coordinates in a meridian plane, and  $(u, v)$  are the corresponding velocity components. If we introduce the velocity potential  $\phi$  and stream function  $\psi$  defined in the usual way, we have

$$(2) \quad \begin{aligned} r\phi_r + \psi_x &= 0 \\ r\phi_x - \psi_r &= 0. \end{aligned}$$

If the roles of the independent and dependent variables are interchanged, the equations (2) become

$$(3) \quad \begin{aligned} rx\psi + r\phi &= 0 \\ rr\psi - x\phi &= 0. \end{aligned}$$

We are interested in the conservation laws of the flow derived from these equations. That is, we consider differential equations for  $x$  and  $r$  as functions of  $\phi$  and  $\psi$  which follow from (3) and which can be put into the form

$$(4) \quad \frac{\partial \xi(x, r)}{\partial \phi} + \frac{\partial \eta(x, r)}{\partial \psi} = 0$$

or, written out explicitly,

$$(5) \quad \xi_x x\phi + \xi_r r\phi + \eta_x x\psi + \eta_r r\psi = 0.$$

This may also be expressed by the assertion that

$$(6) \quad dX = -\eta(x, r)d\phi + \xi(x, r)d\psi$$

is an exact differential for every solution of (3). Integration of  $dX$  over the boundary of the flow region will lead to relations involving the boundary values of  $\phi$  and  $\psi$  and, hence, the velocity components.

Any linear combination of the left sides of the equations (3) that can be brought into the form (4) will be a conservation law of the flow and will define a corresponding function  $X$  for any flow satisfying the equations (2). All conservation laws which are consequences of (3) in this sense will be obtained by requiring that

$$(7) \quad \begin{array}{|c c c c|} \hline & -1 & 0 & 0 & r \\ & 0 & r & 1 & 0 \\ \hline \xi_x & \eta_x & \xi_r & \eta_r & \\ \hline \end{array}$$

has rank 2, leading to the equations

$$(8) \quad \begin{aligned} r\xi_r - \eta_x &= 0 \\ r\xi_x + \eta_r &= 0. \end{aligned}$$

We obtain solutions of (8) and the associated function for a flow around an obstacle and deduce some inequalities for these flows by exploiting the properties of the functions. One such inequality is our Theorem III.1:

$$\left\{ \begin{aligned} &\int_{-a}^a \left\{ \int_a^x \frac{r^2(t)}{[t^2+r^2(t)]^{\frac{n+2}{2}}} P'_n \left( \frac{t}{\sqrt{t^2+r^2(t)}} \right) q(t) \sec \theta(t) dt \right\} \\ &\left\{ \frac{r^2(x)}{[x^2+r^2(x)]^{\frac{n+2}{2}}} P'_{n+1} \left( \frac{x}{\sqrt{x^2+r^2(x)}} \right) q(x) \sec \theta(x) \right\} dx \geq 0, \quad n \geq 1, \end{aligned} \right.$$

where  $r = f(x)$  is the equation of the body,  $q$  is the velocity,  $\theta$  is the angle of the flow along the body and  $P'_n$  denotes the derivative of the  $n$ th Legendre polynomial. The origin of coordinates is taken at the midpoint of the body on the axis of symmetry, the length of the body is  $2a$ , and  $f(x)$  is assumed to be continuously differentiable.

We bring into play Loewner's concept of strongly elliptic mappings by considering a pair of functions  $X$  defined by two sets of solutions of (8) as representing a mapping from the  $\phi - \psi$  plane to a  $X_1 - X_2$  plane. Such a mapping is called strongly elliptic in a domain  $D$  of the  $\phi - \psi$  plane if

$$(9) \quad \begin{vmatrix} \Delta(X_1)_\phi & \Delta(X_1)_\psi \\ \Delta(X_2)_\phi & \Delta(X_2)_\psi \end{vmatrix}$$

does not oscillate in sign for arbitrary pairs of points in  $D$ . Using this concept we obtain further inequalities for flows about obstacles. As an example we cite our Theorem VI.1:

$$(10) \quad \Delta\phi \Delta x + \Delta\psi \Delta \log r > 0$$

for any pair of points exterior to the body and not lying on the axis of symmetry.

As an incidental result we show that for the axially-symmetric flow past a body which is symmetric with respect to the  $r$ -axis, and for which  $r = f(x)$  is a monotone decreasing and continuously differentiable function in the right half of the upper half meridian plane, the velocity on the  $r$ -axis  $q(0, r)$  is a monotonically decreasing function of  $r$ .

Using this result we obtain additional inequalities like Theorems III.1 and VI.1 for this special class of bodies.

Finally, we apply the concepts of general conservation laws and strongly elliptic mappings to obtain similar inequalities for the problem of capacity.

57 pages. \$1.00. Mic 56-2293

1. Loewner, C. "Conservation Laws in Compressible Fluid Flow and Associated Mappings," J. Rational Mech. Anal., II (1953), pp. 537-561.

## MINERALOGY

### A MINERALOGICAL STUDY OF SEVERAL HYDROUS VANADATES

(Publication No. 16,723)

Lois Weiser Luedemann, Ph.D.  
The Pennsylvania State University, 1956

This study was undertaken primarily to investigate a group of non-silicate fine grained minerals with respect to the relationships among composition, structure and morphology in order to learn whether or not these relationships were analogous to those discovered in the study of the clay minerals.

The following group of hydrous vanadates was selected as the subject of the investigation:

<u>Mineral</u>	<u>Idealised Formula (anhydrous)</u>	<u>Water Content As Observed</u>
Hewettite . . . . .	CaV <sub>6</sub> O <sub>16</sub>	·3-8 H <sub>2</sub> O
"Meta"-Hewettite . .	CaV <sub>6</sub> O <sub>16</sub>	·3-8 H <sub>2</sub> O
Sodium Hewettite . .	Na <sub>2</sub> V <sub>6</sub> O <sub>16</sub>	·3 H <sub>2</sub> O
Carnotite . . . . .	K <sub>2</sub> (UO <sub>2</sub> ) <sub>2</sub> (VO <sub>4</sub> ) <sub>2</sub>	·3 H <sub>2</sub> O
Tyuyamunite . . . . .	Ca(UO <sub>2</sub> ) <sub>2</sub> (VO <sub>4</sub> ) <sub>2</sub>	·6.5-8 H <sub>2</sub> O
Pascoite . . . . .	Ca <sub>3</sub> V <sub>10</sub> O <sub>28</sub>	·17 H <sub>2</sub> O
Hummerite . . . . .	K <sub>2</sub> Mg <sub>2</sub> V <sub>10</sub> O <sub>28</sub>	·17 H <sub>2</sub> O
Metarossite . . . . .	CaV <sub>2</sub> O <sub>6</sub>	·2 H <sub>2</sub> O

These minerals occur on the Colorado Plateau as secondary alteration products and are described in the literature as fine grained, lath-like or platey species. In the list above, those within brackets have been reported to be similar in structure.

Of the materials used in this study, six were naturally occurring minerals from the Plateau and two, pascoite and hummerite, were synthesized.

The method of analysis was designed to follow and characterize the changes in composition, structure and morphology resulting from the addition of thermal energy to the mineral system. This was accomplished for each sample by integrating the data obtained for it from differential thermal analysis, determination of weight loss as a function of temperature, x-ray and electron diffraction studies, infrared analysis and microscopic study. Standard x-ray spectrometer and microscopic techniques were modified so that observations could be made while the samples were held at higher temperatures. The temperature range studied included the span from ca. 27°C to 1000°C.

The state of hydration is an important variable in most of these minerals.

Their response to treatment indicates that in hewettite, "meta"-hewettite, sodium hewettite, carnotite and tyuya-

munite the water is essentially inter-layer water.

Of these, sodium hewettite and carnotite do not hydrate above the 3 H<sub>2</sub>O state. The dehydration of sodium hewettite (3 H<sub>2</sub>O) may be correlated with a decrease in basal spacing and total dehydration appears to result in a doubling of the b axis. The structure achieved at this stage remains to the liquidus temperature. Dehydration of carnotite (3 H<sub>2</sub>O) has very little effect upon the structure. The anhydrous material undergoes a structural modification at 1000°C. The modified form reverts to the original structure if the sample is either allowed to stand 48 hours in a dessicator over P<sub>2</sub>O<sub>5</sub> or is treated with water.

The response of "meta"-hewettite to treatment is very similar to that of hewettite. Both of these and tyuyamunite form hydrates up to 8 H<sub>2</sub>O. The water content and basal spacings of these three are very sensitive to fluctuations in vapor pressure at room temperature. Dehydration of the 8 H<sub>2</sub>O hydrates may be correlated with a decrease in their basal spacing. The anhydrous structures undergo a modification at higher temperatures. The modification does not appear to be reversible and the modified forms remain to the liquidus temperature.

The hewettites are lath-like minerals while carnotite and tyuyamunite are platy with an ill defined shape in the plane perpendicular to the plates. None of these minerals show any basic change in morphology below the liquidus or, in the case of carnotite, below 1000°C (liquidus of carnotite above 1000°C).

Other than the general similarities in degree of hydration as noted above, the hewettite minerals are distinct from carnotite and tyuyamunite.

In the hewettite minerals, the a and b dimensions were observed to be 12.0 ± .3 Å, and 3.60 ± .05 Å respectively in each of the three samples. When hewettite is treated with a 0.1 Normal solution of NaCl it loses the property of reversible expansion and in this respect becomes similar in behaviour to sodium hewettite. This indicates that base exchange is possible in the hewettite structures.

Some similarity is evident in the x-ray patterns of tyuyamunite (3 H<sub>2</sub>O) and carnotite. The capacity for base exchange in these structures has been established by Muratta et al. (1950).

The response of pascoite and hummerite to treatment indicates that the water in these minerals serves to coordinate the cations in the structure. Both of these minerals lose their water in two distinct steps and each step results in the abrupt breakdown of the previously existing structure. In both cases, total dehydration results in an amorphous state. In the case of pascoite, recrystallization takes place slowly as the sample is heated above ca. 250°C. In the case of hummerite, a sharp recrystallization takes place at ca. 330°C. In both cases, the recrystallized structure remains to the liquidus temperature.

Pascoite loses more water (10.5 H<sub>2</sub>O) in the first dehydration step than in the second (6.5 H<sub>2</sub>O) while hummerite loses less (4 H<sub>2</sub>O) in the first step than in the second (13 H<sub>2</sub>O). A possible correlation of this difference with differ-

ences in cation content between the two minerals is discussed.

Synthetic crystals of pascoite and hummerite are much larger than those of the natural minerals. The synthetic pascoite crystals tend to be tabular and to crack and break apart on dehydration. Synthetic crystals of hummerite tend to be prismatic. The first step in dehydration causes an expansion of the lattice and in general, the crystals crack and break apart on dehydration.

Metarossite loses all of its water in one well defined step at ca. 130°C. The abrupt change in x-ray pattern associated with the dehydration of metarossite is analogous to the behaviour of pascoite and hummerite. However, shrinkage observed microscopically to be in only one dimension suggests that the water may be held as inter-layer water in a way which is more essential to the stability of the structure than the inter-layer water of the clay minerals. In this respect, metarossite may represent a type of hydrate intermediate to the hewettite type hydrates and the pascoite-hummerite hydrates. Metarossite occurs in platey to tabular crystals which shrink preferentially in one dimension on dehydration as noted above.

The final anhydrous products obtained from the minerals which are non-uraniferous vanadates containing primarily divalent cations all have similar structures as reflected in their x-ray patterns. The minerals included in this group are pascoite, metarossite, hewettite and "meta"-hewettite.

The liquidus temperatures of the hewettite minerals and pascoite lie within the range 615 ± 25°C. The liquidus

temperature of hummerite is below this range (ca. 490°C) and those of metarossite and tyuyamunite are above this range (ca. 760°C and ca. 950°C respectively). The liquidus of carnotite does not fall within the temperature range studied.

The liquidus and solidus coincide only in the cases of sodium hewettite and metarossite.

The natural materials were found to be impure with regard to their ideal cation content. All of the natural materials contained calcium, magnesium, sodium and potassium in varying amounts. Sodium hewettite was found to be the purest of the natural materials.

The effect of various cations on dehydration properties and structural stability is discussed.

#### VITA

Lois Weiser Luedemann was born on March 22, 1931 in Oak Park, Chicago, Illinois. She received the Bachelor of Arts degree in Geology from Hunter College of the City of New York in June 1951, the Master of Science degree in Geology from Syracuse University in January 1953 and the degree of Doctor of Philosophy in Mineralogy from The Pennsylvania State University in January 1956.

She has spent several summers in research work for the Geochemistry and Petrology branch of the United States Geological Survey and has conducted her research at The Pennsylvania State University under contract with The Office of Naval Research.

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249 pages. \$3.11. Mic 56-2294

#### MUSIC -

##### SYMPHONY NO. 3: I. ALLEGRO CON SPIRITO. II. ALLEGRETTO. III. VIVACE.

(Publication No. 16,553)

Paul Fetler, Ph.D.  
University of Minnesota, 1955

Instrumentation: Piccolo, 2 Flutes, 2 Oboes, 2 Clarinets, 2 Bassoons, 4 Horns, 3 Trumpets, 3 Trombones, Tuba, Timpani, Percussion (Bass Drum, Cymbals, Snare Drum, Tamburine, Triangle, Wood Block, Xylophone), Strings.

Basically this Symphony follows the classical forms, with modifications necessitated by contemporary factors of creativity. Harmonic fluctuation plays an important part at all times. The use of tonal centers and their relationship to the entire work is also of great significance. The work is in three movements. Duration: approximately 22 minutes.

##### I. Allegro con spirito

This movement is written in modified Sonata-Allegro form. Theme I is diatonic and is based on the Lydian

mode (transposed). Theme II is based on a long melodic line containing lyric qualities and creating the desired contrast. Theme III is transitional in nature and also serves as conclusion to the exposition. The development is primarily based on theme I with an occasional use of theme III. The recapitulation employs the themes in reverse order. A forceful use of theme I concludes the movement.

##### II. Allegretto

The second movement employs the A-B-A form, making use of a variety of irregular meters. A fragmentary motive, which is continuously developed, forms the first section. The middle section is based on extended melodic lines accompanied by a repetitious pulsation of chords. The third section is a repetition of the first part in extended form.

##### III. Vivace

The last movement also makes use of the A-B-A form, the middle section forming a theme with variations. The first part is based on a light, dance-like principal theme

which undergoes various stages of development. This is followed by a contrasting middle section based on a syncopated theme which makes use of the variation principle. The last section employs once again the principal theme material which leads to a climactic conclusion of the work.

The first performance of Symphony No. 3 took place on Friday evening, November 25, 1955, in Northrop Memorial Auditorium, University of Minnesota campus, at a regular subscription concert by the Minneapolis Symphony Orchestra, Antal Dorati conducting.

127 pages. \$1.70. Mic 56- 2295

**A STUDY OF MUSIC IN GENERAL EDUCATION  
AND A MANUAL FOR TEACHING GENERAL MUSIC  
IN THE LOWER SECONDARY GRADES  
(PARTS I AND II)**

(Publication No. 16,613)

Arthur Joseph Keegan, Ed.D.  
New York University, 1956

Chairman: Professor Walter A. Anderson

The problem considered in this investigation was divided into two parts. Part one was concerned with research of music education literature to determine desirable subject matter for a course in general music education, and also the evaluation of the content for a music course by two juries of music educators. Part two is the manual for teaching general music classes based upon the investigation, and the educators' evaluation of music activities developed from the research.

The foregoing basic statements of the problem are clarified by several subordinate problems, "What are desirable general education outcomes for music study in early secondary grades?", "What contributions can be obtained from a study of music education literature which would constitute desirable outcomes in a general music course?" and "What teaching-learning principles should guide the organization of music activities and experiences in general education?"

The research assumes major importance because the findings indicate no provision in the high school music curriculum for students who do not specialize in band, orchestra or chorus. This group constitutes approximately ninety per cent of the student body. If students are to have the benefit of a broad cultural background they should be afforded actual experiences in music according to their interests, abilities and aptitudes.

The term "general music" is of recent origin in music education and is defined as that part of the program of musical instruction intended for all members of the student body. It embraces a variety of musical experiences. Educators believe that "music appreciation" and "fundamentals of music" do not "reach" students because of formal methods of presentation, and lack of genuine student participation in music activities.

General music activities discovered in the study of music education literature were analyzed and classified under headings of singing, music listening, rhythmic expression, creative music, playing of instruments, reading and writing

music, and teaching-learning principles. A master schedule of these categories and related activities was submitted to music educators for an evaluation rating.

The master schedules were sent to two juries, a national group of fifty music educators and a New Jersey group of fifty music educators for their judgment concerning the importance of these activities in a course of music. The analysis of the returns was based upon a numerical value assigned to each item in an ascending rating scale from "no value" to "very essential." These data were then tabulated and arranged under the foregoing categories in sixty-two tables.

From the analysis of tables comprising national and New Jersey music educators' judgments of music activities, criteria were developed for a functional course of music for the student in general education.

Some of the significant findings were:

1. The area of singing is deemed to be the most important activity of the several music categories for general music.
2. New Jersey and national jurors are in agreement concerning the recommended activities for general music.
3. Music educators agreed that music activities should be integrated with other subjects and opportunities provided for participation in music activities by all students.
4. There was agreement that the general music program would be improved by better plant facilities and music equipment for rhythmic and instrumental activities.

Over-all conclusions are as follows:

For Part one, the recommendations call for a program of general music which place emphasis on singing but includes music listening, rhythmic expression, instrumental experiences, creative music, and reading and writing music.

For Part two, the manual incorporates the recommendations of music educators for content and procedures in teaching general music in the early secondary grades.

486 pages. \$6.08. Mic 56-2296

**AN EVALUATION OF THE COMPETENCIES OF  
BEGINNING ELEMENTARY CLASSROOM TEACHERS  
IN MUSIC THEORY AND SINGING IN VARIOUS  
TEACHER-TRAINING INSTITUTIONS  
OF NEW ENGLAND**

(Publication No. 16,989)

Dennis K. Kiely, Ed.D.  
Boston University School of Education, 1956

**Problem**

The purpose of this study was: (1) to determine the competencies of beginning elementary classroom teachers in music theory; and (2) to determine the competencies of beginning elementary classroom teachers in singing.

**Procedures**

The procedures used in this study revolved around the following main objectives: (1) the determination of items of music theory considered essential knowledge for elementary classroom teachers; (2) the level of achievement attained in music theory; (3) the level of competency achieved in singing; and (4) the influence of various musi-

cal experiences on the levels of achievement attained in music theory and singing.

A sample population of 396 students, or approximately 24 per cent of the total New England population of college seniors majoring in elementary education who took theory tests, were obtained from eight colleges which had been drawn randomly in each state. In addition, 127 students or 32 per cent of the sample population were drawn at random and recorded to obtain a sample of singing abilities.

#### Conclusions

1. Beginning elementary classroom teachers in New England, as a group, have reached a substantial level of achievement in music theory as evidenced by the index of ease of .73 which was obtained for the total test, but the level of achievement deemed essential by the jury in this study was not attained.

2. Significant differences in the music theory test scores were found for students who had any of the following: vocal music experience in college or in the community, instrumental music experience in college or high school, when their scores were contrasted with the test scores of students who did not have these experiences.

3. Beginning teachers in New England, as a group, are close to achieving a level of competency in singing that will serve as a model for children to imitate and which may be deemed adequate for the self-contained classroom, but they have very little ability in reading new vocal music and, in this respect, the effective and independent teaching of music in the self-contained classroom does not seem to be possible at the present time.

4. Significant differences in the ratings attained for singing a familiar song unaccompanied were found for students who had vocal music experience in college and for those students who had vocal music experience in high school when contrasted with the ratings of students who did not have these experiences.

5. Significant differences in the ratings attained for reading a new song unaccompanied were found for students who had vocal music experience in college when contrasted with the ratings attained by students who did not have this experience. No significant difference was found for students who had vocal music experience in high school.

6. There were no significant differences found in the ratings attained for singing a familiar song unaccompanied or reading a new song unaccompanied by groups who had instrumental music experience in either college, high school, or the community when contrasted with the ratings attained by groups who did not have these experiences.

7. No significant differences were found in the ratings attained for reading a new song unaccompanied between groups having a preference for primary grades when compared with the ratings of those who stated a preference for intermediate grades. The common assumption that teachers of intermediate grades would, because of the introduction of music reading in their grades, be more competent in this skill, was not borne out by this evidence.

8. Coefficients of correlation found between each sub-test of music theory and the ability to sing either a familiar song unaccompanied or to read a new song unaccompanied ranged from a negative -.05 to a positive .58.

206 pages. \$2.70. Mic 56-2297

#### A STUDY OF TEN ORIGINAL COMPOSITIONS FOR BAND PUBLISHED IN AMERICA SINCE 1946

(Publication No. 17,029)

Frank Joseph Prindl, Ed.D.  
The Florida State University, 1956

#### The Problem:

Few major composers have written for the concert band until recent years. This study is based on the assumption that due to improved performance standards, expanding musical interests of band directors, and dissatisfaction with transcriptions, music publishers are gradually releasing more compositions by competent composers, and that a significant body of literature is now being written for the medium.

The problem of this dissertation is to analyze ten extended works for band published in the United States since 1946.

The compositions analyzed are: Creston, Celebration Overture and Zanoni, Gould, Ballad for Band, Hanson, Chorale and Alleluia, Lockwood, The Closing Doxology, Milhaud, Suite Francaise, Persichetti, Pagaent, Schoenberg, Theme and Variations, Schuman, George Washington Bridge, Thomson, A Solemn Music.

#### Method:

In attempting to evaluate the compositions in this study, the following method was used:

1. Inclusion of a short biographical sketch of the composer, with brief statements as to his importance as a composer and his general style of writing.
2. Inclusion of a general statement concerning overall style of the composition.
3. Description of the formal structure or organization of the composition.
4. Analyses of harmonic and rhythmic textures.
5. Analysis of instrumentation.
6. Inclusion of a personal evaluation.

#### Conclusion:

Characteristic of most contemporary composers is the tendency for experimentation and the constant re-examination of traditional music. This study indicates that at least nine of our contemporary composers, in their attempts to create new sounds, new structures, and new techniques, have turned to the concert band as a serious medium for their musical expression.

124 pages. \$1.65. Mic 56-2298

## PHARMACOLOGY

### A NEUROPHARMACOLOGICAL ANALYSIS OF CENTRAL MECHANISMS IN RESPIRATORY RHYTHMICITY

(Publication No. 16,884)

David Alan Brodie, Ph.D.  
University of Utah, 1956

Chairman: Dr. Louis S. Goodman

The purpose of this research was to provide information on the respiratory stimulant action of cyanide and to elucidate the mechanism of the central regulation of respiration. Seventy-nine experiments were performed on decerebrate cats. The peripheral chemoreceptor nerves were severed as required. Thoracic and abdominal respirations were recorded by pneumographs with strain gauges connected to Sanborn amplifiers and recorders. In all experiments the blood pressure was either recorded, with an electromanometer, or monitored. Electrical stimulation of the brain stem was carried out through a bipolar nichrome wire electrode and by the use of square-wave impulses delivered from a Grass stimulator. The voltage rarely exceeded 9 volts and the frequency did not exceed 60 cycles per second. Cauterization of the brain stem was performed with simple hot wire cautery. Gas mixtures were inhaled through a one-way demand valve from a spirometer and all carbon dioxide mixtures contained 20% oxygen.

Transection of the brain stem, in a rostral to caudal manner, produced apneustic respiration when the rostral pons was removed. Transection at the level of the acoustic striae resulted in gasping respiration. These changes in respiration occurred even when the IXth and Xth cranial nerves were sectioned and the cerebellum was removed.

In the decerebrate preparation, with the peripheral chemoreceptor nerves cut, cyanide increased both rate and amplitude of respiration (mainly the latter). The response lasted from 15 to 20 minutes. Tachypylaxis of the respiratory effect was not seen and there was no constant relationship between the blood pressure and respiratory effects. The respiratory stimulation always outlasted any effect on blood pressure. Carbon dioxide increased the rate and amplitude, and thiopental prolonged the inspiratory component, of the respiration in the decerebrate cat.

Apneustic respiration was characterized by sustained inspirations, of varying duration, which were never so prolonged that they resulted in the death of the animal. Cyanide reversibly reduced the apneustic inspiratory tone and unmasked gasping respiration. Carbon dioxide and thiopental had similar effects, but these effects were not as clear cut as those of cyanide.

Gasping respiration was routinely produced by transection at the level of the acoustic striae. Cyanide increased both the rate and the depth of the gasping, but this stimulation lasted only about 5 minutes. Carbon dioxide inhalation (8% or 10%) had no detectable effect on gasping even

when the peripheral chemoreceptor nerves were intact. Prolonged hyperventilation effected mechanically also had little effect on gasping and never produced a post-hyperventilation apnea in the medullary (gasping) animal. The inhalation of 10% oxygen slightly depressed gasping and the inhalation of 100% oxygen had no effect in this preparation. Thiopental depressed both the rate and the amplitude of gasping. Superficial cauterization of the floor of the fourth ventricle in the decerebrate preparation produced apneustic respiration. Deeper cauterization of this same area resulted in a gasping type of respiration which could not be distinguished from that seen after transection at the level of the acoustic striae. However, cyanide acted only to increase the amplitude of gasping in this preparation. Other cauterization experiments demonstrated that over half of the dorsal aspect of the medulla had to be removed in order to abolish gasping in the medullary animal.

Electrical stimulation of the interior of the medulla in the decerebrate cat produced 3 types of respiratory responses: namely, sustained inspiration, sustained expiration, and cough. Cyanide regularly increased the height of the sustained inspiration, in one case converted the sustained expiration to sustained inspiration, and consistently increased the threshold stimulus required to prevent rhythmic respiration from breaking through the sustained inspiration or sustained expiration. Carbon dioxide had a similar effect on the threshold necessary to prevent rhythmic respiration from breaking through sustained inspiration or sustained expiration, but the gas did not alter the position of the sustained response. In one experiment on cough, cyanide transiently abolished the electrically-induced cough response.

Stimulation of the inspiratory area in the medullary animal produced sustained inspiration in both the gasping and the apneic preparations. Short bursts of repetitive shocks in the apneic animal produced gasps which were indistinguishable from those seen in the spontaneously gasping animal.

Electrical stimulation of the floor of the fourth ventricle accelerated gasping in the medullary animal and reversibly converted respiration in the intact brain stem preparation to a gasping type of breathing. The sensitive area for this response was mapped and found to be a bilateral superficial surface which covered an area extending rostrocaudally 3 to 6 millimeters above the obex and extending laterally 3 millimeters on each side of the midline.

Local application of drugs to the floor of the fourth ventricle demonstrated that procaine hydrochloride solution had no effect on respiration but that the crystalline drug depressed respiration and produced apnea. Sodium cyanide solution (1%) placed on the area of the acoustic striae selectively stimulated the rate of respiration.

It is concluded that the respiratory action of cyanide is a combination of stimulation and depression of respiratory substrates. The effect on pontine areas is one of depres-

sion which releases a gasping type of respiration, whereas the effect on the medulla is a brief depression of the cycling mechanism followed by stimulation. This stimulant effect is attributed to 3 factors: (1) an increase in rate via an action on structures in the dorsal medulla, (2) an increase in amplitude via an action on structures in the ventral medulla, (3) and stimulation of neurons in the ventral medulla concerned with the inherent rhythmicity of respiration.

The lack of stimulant effect of carbon dioxide on medullary respiration provided evidence for assigning its locus of action to the pons. The effect of thiopental suggested a differential depression of all reactive respiratory structures.

A theory for the central control of respiration was constructed from the experimental data. The component parts are visualized as being distributed in the pons and medulla and consist in (1) an oscillator in the ventral medulla which provides the inherent rhythmic discharge for respiration, (2) a pacemaker in the dorsal medulla which controls the rate of discharge of the oscillator, (3) a modulator in the pons which influences the shape of the oscillator discharge, and (4) an integrator in the ventral medulla which coordinates the respiratory impulses to produce the final discharge to the lower (spinal) motor neurons which innervate the respiratory muscles. The use of this theory to explain the effects of drugs on respiration has been illustrated.

142 pages. \$1.90. Mic 56-2299

#### THE EFFECT OF ESTROGENIC HORMONES ON CARDIAC IRRITABILITY AND ELECTROLYTE EXCHANGE

(Publication No. 16,974)

Edward Hoepfner Grinnell, Ph.D.  
The University of Oklahoma, 1956

Supervisor: Professor Paul W. Smith

The exact mechanism by which cells maintain their intracellular sodium/potassium ratio and the effect of certain drugs or pathological conditions on this ratio has been the subject of much research. The general theories that have been advanced by other investigators have been discussed. A somewhat new and different interpretation of the active sodium transport theory has been utilized to explain the possible mechanism by which digitalis exerts its action on the myocardium.

The findings of this study may be summarized as follows:

1. Castrate female dogs have been found to be highly sensitive to the toxic effects of a cardiac glycoside in comparison with normal female or castrate females treated with an estrogenic substance.
2. The rise of plasma potassium which follows the administration of a toxic dose of digoxin is significantly higher in the sensitive, castrate animal than in the normal or estrogen-treated castrate animal.
3. It is a reasonable conclusion that loss of potassium from the myocardium contributes significantly to the rise in plasma potassium.

4. The mechanism by which tissues maintain a high intracellular potassium is believed to involve an active process of sodium extrusion. It is, therefore, concluded that this mechanism is impaired in the absence of the animal's normal estrogenic hormones, and as a consequence the heart of the castrate animal loses potassium excessively under the influence of a cardiac glycoside at a toxic dosage level.
5. It is concluded that the excessive potassium loss from the heart of the castrate female animal contributes to its increased sensitivity to digitalis.

35 pages. \$1.50. Mic 56-2300

#### SIMULTANEOUS RESPIRATORY MINUTE VOLUME AND TOOTH PULP THRESHOLD CHANGES FOLLOWING LEVORPHAN, MORPHINE AND LEVORPHAN-LEVALLOLPHAN MIXTURES IN RABBITS

(Publication No. 16,137)

George Kwock Wah Yim, Ph.D.  
State University of Iowa, 1956

Chairman: Associate Professor H. H. Keasling

Simultaneous respiratory minute volume and tooth pulp threshold changes (the latter was measured by a modification of the method of von Fleisch and Dolivo, 1953) were determined following the intravenous administration of levorphan, morphine and levorphan-levallophan mixtures in rabbits, in hope of obtaining data relative to the mechanism of antagonism of levallophan, and to the possible existence of preferential antagonism of respiratory depression over tooth pulp threshold elevation.

Dose response relationships for morphine and levorphan revealed that in general, it appeared that levorphan was at least twice as active as morphine on a molar basis in producing increases in tooth pulp threshold, and, for equal increases in tooth pulp threshold, levorphan produced less prolonged depression of respiratory minute volume than morphine at doses below 0.008 and 0.0016 millimoles/kgm., respectively.

When a constant dose of levorphan was administered simultaneously with varying amounts of levallophan, there was no evidence of preferential antagonism of the respiratory minute volume depression over tooth pulp threshold changes. Further, in no case did combinations fail to give depression of respiratory minute volume and elevation of tooth pulp threshold. However, on increasing the dose of combined drugs in the ratio of one part levallophan to five parts of levorphan, it was possible to obtain elevations in tooth pulp threshold equivalent to those produced by 0.002 millimoles/kgm. levorphan alone with significantly less respiratory minute volume depression.

10 pages. \$1.00. Mic 56-2301

## PHILOSOPHY

### NATURALIST-HUMANISM IN EIGHTEENTH CENTURY ENGLAND: AN ESSAY IN THE SOCIOLOGY OF KNOWLEDGE

(Publication No. 13,610)

Maxine Greene, Ph.D.  
New York University, 1955

The relationship between philosophic idea and cultural change has been often referred to; but the quality of that relationship has seldom been explored. This dissertation concerns the emergence of a philosophic world view defined as naturalist-humanism within the context of 18th century English culture. It represents an effort to put to concrete test the hypothesis that philosophy is a function of change, a force working within a culture, articulating meanings, playing a creative role in social change.

Common practice has been to survey intellectual history from the vantage point of individual statement or in terms of cultural event. One approach has considered social institutions externally, as background; the other has related idea to institution with only incidental reference to the actual experience of individuals. The present research is integrative in intent and deals with culture as an organization of relationships, including social institutions, individual and group experience, artistic and philosophic statement, all in dynamic interrelationship.

The process of determining the existence and relevance of naturalist-humanism involved a many-faceted reconstruction of cultural life in conjunction with an evaluation of significant contemporary artistic, sociological, political, and philosophical expressions. The individuals involved were assumed to be enmeshed in cultural experience and reacting to it, each in his idiomatic way. It was also assumed that all their statements were founded on premises of belief whose philosophic dimension was definable.

Analysis of English social institutions between 1730 and 1780 demanded utilization of contemporary records and cultural and intellectual histories; and, since the study was concerned with the shared experiences of individuals, biographical and autobiographical materials were also used. The works of these individuals were explored at first hand, with secondary sources used for validation.

Each individual response was evaluated against naturalist-humanist criteria, interpreted in the light of the actual experience involved, and logically related to meanings and intentions discerned within the culture.

It was discovered, for example, that political life was permeated with demands for "actual representation" and individual liberties, demands complicated by a conflict between the claims of natural right and utility. This was found relevant to the stress placed by a philosopher like David Hume on the worth of individual experience and on the test by consequences. It was related, too, to the poets' assertion of imaginative integrity, to the novelists' interest in character and association, to Adam Smith's reconciliation of private interest with public good. These responses

were found to be anti-absolutist and experiential in naturalist-humanist terms and, therefore, helped to define the role of naturalist-humanism as a function of the social complex.

Awareness of social dislocation was found to relate to reactions against the closed rationalist universe; social reforms were related to the emphasis on sympathy and relatedness; the concern with practical science and the stress on empirical knowing were allied. All these emphases were expressed in naturalist-humanist empiricism, in the view of man participant in an open universe, in the importance attached to feeling and communication throughout life.

The evidence displayed, therefore, warranted the conclusion that what has heretofore been conceived of as a negative reaction to rationalism was a positive philosophic response to certain transformations in the culture, a response characterized as naturalist-humanism.

The implications are many. Among them is the possibility that naturalist-humanism has deeper roots in western thought than may have first appeared. The conclusion also suggests that the beliefs associated with American democracy, many of which are traced to rationalist absolutes, may be susceptible to reevaluation from an empirical, humanist point of view. Much can be done in putting the sociology of knowledge to work. The history of culture can be the proving ground. 471 pages. \$5.89. Mic 56-2302

### WHEWELL'S PHILOSOPHY OF THE INDUCTIVE SCIENCES

(Publication No. 17,067)

Gerald Morton Lucas, Ph.D.  
Columbia University, 1956

This examination of William Whewell's (1794-1866) philosophy attempts to relate Whewell's basic terminology and distinctions more closely to his scientific subject matter than has been the case in earlier studies. Both historically and doctrinally Whewell bridged the gap between abstract philosophies of human understanding, pure reason, and the absolute, on the one hand, and practical laboratory philosophies of careful observation and cautious theorizing on the other hand.

The first chapter records some of Whewell's contributions to virtually all the known sciences of his day, including mathematics, and indicates his practical familiarity with the methods employed in the progress of science.

Whewell's theories of fundamental antitheses and fundamental ideas are basic to his entire work. Although these were inspired by Kant they underwent transformation in Whewell's hands. The most fundamental antithesis is that between ideas and sensations, both being required in the construction of knowledge and both being incapable of being

experienced in isolation. The fundamental ideas serve to organize and formalize the data of experience and under certain conditions give rise to necessary axioms which play a regulative role in inquiry. Unlike Kant's categories, however, they are historically derived and elucidated. Whewell developed several logically independent theories concerning the origin and function of necessary or regulative propositions. Some of these resemble the doctrines worked out later by the conventionalists.

Whewell defines induction to be the process by which the inductive sciences have been formed. His theory as to the nature of that process is that organizing ideas, brought to the materials of observation, tie these observations into new and unified facts of greater generality. One test of the validity of an induction is that the facts of experience may be deduced from the inductive generalization. Another test is the prediction of facts of a different kind from those which inspired the induction.

Other subjects examined by Whewell are the role of

models in theory construction, the historical transformation of hypotheses, the equivalence of hypotheses stated in terms of different models having similar mathematical formulas, and the nature of cause and effect.

The conflict between William Whewell and John Stuart Mill concerning the nature of induction and the tests of its validity is the subject of a separate chapter. This conflict resulted in consigning Whewell's contributions to near oblivion.

While Whewell's discussions are original, enlightening, and comprehensive, his conclusions are framed in awkward and confusing terminology; often opposing solutions are presented for the same problem without indication that these are to be viewed as alternative hypotheses rather than different ways of stating the same thing. Consequently Whewell's Philosophy of the Inductive Sciences must be viewed as a valuable, pioneering contribution to the development of a philosophy of science.

201 pages. \$2.65. Mic 56-2303

## PHYSICS

### PHYSICS, GENERAL

#### VIBRATIONAL SPECTRA OF HEXAFLUOROBUTADIENE-1,3 AND 1-FLUORO-1-CHLOROETHYLENE\*

(Publication No. 16,966)

James Curtice Albright, Ph.D.  
The University of Oklahoma, 1956

Supervisor: J. Rud Nielsen

Infrared absorption spectra of gaseous  $\text{CF}_2:\text{CF}-\text{CF}:\text{CF}$ , and gaseous  $\text{CFCl}:\text{CH}_2$  were obtained with a Perkin-Elmer Model 112 double pass spectrometer equipped with prisms of  $\text{LiF}$ ,  $\text{NaCl}$  and  $\text{CsBr}$ . The Raman spectrum of liquid  $\text{CF}_2:\text{CF}-\text{CF}:\text{CF}_2$ , at  $20^\circ \text{C}$  and  $-120^\circ \text{C}$ , was photographed with a three prism spectrograph of linear dispersion 15  $\text{A/mm}$  at 4358  $\text{A}$ , and polarization ratios were measured for the stronger bands. Weakly exposed Raman spectra were obtained of gaseous  $\text{CF}_2:\text{CF}-\text{CF}:\text{CF}_2$  at room temperature and of solid  $\text{CF}_2:\text{CF}-\text{CF}:\text{CF}_2$  at  $-160^\circ \text{C}$ . The Raman spectrum of gaseous  $\text{CFCl}:\text{CH}_2$  was obtained with the sample at room temperature.

Previous investigations of  $\text{CH}_2:\text{CH}-\text{CH}:\text{CH}_2$  by Aston, Szasz, Woolley and Brickwedde,<sup>1</sup> and by Richards and Nielsen,<sup>2</sup> indicate that its most stable molecular configuration has the symmetry  $C_{2h}$  ("trans"). The spectral data obtained for  $\text{CF}_2:\text{CF}-\text{CF}:\text{CF}_2$  are inconsistent with the assumption of a trans configuration, but can be explained satisfactorily on the assumption of a planar configuration of symmetry  $C_{2v}$  ("cis"). However, the data do not exclude the possibilities that the molecules have a nonplanar configuration of symmetry  $C_2$ , or that the compound consists of a mixture of molecules of different configurations.

In the Raman spectrum of the liquid phase, three strong bands appear near  $1800 \text{ cm}^{-1}$  where only two fundamentals are expected, suggesting the possibility of two

molecular forms existing together. One of these bands, however, can be interpreted as a combination band in Fermi resonance with one of the fundamentals. In view of this and the fact that all of the observed infrared and Raman bands have been given a satisfactory interpretation on the assumption of a cis configuration, it is believed that molecules of  $\text{CF}_2:\overline{\text{CF}}-\text{CF}:\text{CF}_2$  exist only in one form.

The twenty-four fundamental vibrational frequencies of  $\text{CF}_2:\text{CF}-\text{CF}:\text{CF}_2$  have been assigned as follows on the assumption of the molecular symmetry  $C_{2v}$ : species  $a_1$ : 192, 375, 463, 633, 699, 928, 1140, 1378, 1796;  $a_2$ : 170, 210, 321, 576;  $b_1$ : 291, 422, 530, 625, 972, 1193, 1330, 1732;  $b_2$ : 260, 330, and 550. There is some uncertainty with regard to the symmetry species of the fundamentals at 210, 260, 321, 330, 625, and  $633 \text{ cm}^{-1}$ . However, the interpretations of combination bands favor the species assignments given.

The infrared spectrum from 3 to 20 microns of  $\text{CFCl}:\text{CH}_2$  has been obtained previously by Torkington and Thompson<sup>3</sup> who assigned most of the fundamentals. After completion of the present work, Mann, Acquista, and Plyler<sup>4</sup> have reported infrared data from 1.6 to 52 microns and have given an assignment of all the fundamental vibrational frequencies in complete agreement with that of the present work.

The twelve fundamentals of  $\text{CFCl}:\text{CH}_2$  have been assigned as follows: species  $a'$  (planar vibrations): 370, 433, 698, 946, 1185, 1385, 1654, 3018, 3071;  $a''$  (out-of-plane vibrations): 514, 610 and 835. On the basis of these fundamentals, all of the observed bands, except one weak shoulder in the infrared spectrum, have been interpreted satisfactorily. Several bands observed in the infrared spectrum of  $\text{CFCl}:\text{CH}_2$  have been identified with an impurity. These bands were also observed by Mann, et al., who attempted to interpret them as combination bands of  $\text{CFCl}:\text{CH}_2$ .

101 pages. \$1.50. Mic 56-2304

\*This work has been supported by the U.S. Atomic Energy Commission.

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#### A GROUP THEORETICAL APPROACH TO THE BAND STRUCTURE OF TELLURIUM

(Publication No. 17,207)

Robert H. Asendorf, Ph.D.  
University of Pennsylvania, 1956

Supervisor: Herbert B. Callen

The application of group theoretical methods relating to the band structure of solids is discussed. Particular emphasis is given to the reduction of space groups possessing screw axes; the reduction of such groups presents special difficulties and various methods for obtaining their irreducible representations are discussed. An idempotent operator method is employed to obtain the proper linear combinations of wave functions appropriate to the different irreducible representations.

The foregoing analysis is applied to tellurium; the space group of tellurium is reduced; its Brillouin Zone is analyzed; and the proper linear combinations of wave functions are obtained. A tight-binding calculation is then set up for an explicit determination of the band structure of tellurium; for simplicity, only p functions are used. First and second nearest neighbor interactions are taken into account using the two center approximation. Contributions of the first and second nearest neighbors are estimated using Slater's atomic orbitals. The energy vs. wave vector curves are discussed along the line of highest symmetry in reciprocal space. The energy gap of tellurium is found to be small and the band edge occurs at or very near the center of the Brillouin Zone. A numerical fitting to certain experimental data not yet available is anticipated. Optical selection rules are given.

151 pages. \$2.00. Mic 56-2305

#### EXPERIMENTAL INVESTIGATION OF FIELD ION EMISSION

(Publication No. 16,700)

Kanwar Bahadur, Ph.D.  
The Pennsylvania State University, 1956

This research was undertaken to study basic facts about field ion emission. A detailed experimental investigation is described which confirmed the theoretical conclusions and led to an improvement of the field ion microscope.

Field strength versus ion current characteristics were first measured in a two electrode tube. For more accurate measurements a Faraday cage was used as ion collector in order to eliminate secondary electrons. It was found that part of the spurious ion current must arise due to spatial ionization of gas molecules by fast ions. In the final measurements made with different inert gases, at various pressures and field strengths, both these spurious effects are believed to have been eliminated. The results show that true ion currents are about 3 to 5 times lower than the currents measured in a two electrode microscope tube. The characteristics agree very well with the theoretical results, derived for the high field range on the assumption that the supply of molecules to the emitter is enhanced by dipolar attraction of the gas molecules in the inhomogenous field of the emitter:

- (1) The ion currents are directly proportional to pressure.
- (2) The ion currents are proportional to  $3/2$  power of the accelerating voltage.
- (3) Experimental and the theoretical absolute values of ion currents show close agreement.

In order to locate the origin of the ions, the retarding potential method was used. The results indicate the formation of ions in a region from 5 to 100 Å from the emitter surface, the precise extent of the region varying with the gas used and with the field strength at the tip. The experimentally measured minimum distance at which the ions are formed and the velocity distribution of ions agree closely with the theoretical results derived from the following mechanism. In the very high fields near the emitter surface, the potential wall of the molecule approaching towards the emitter is thinned down considerably. There is then a finite probability for an electron in the ground state of the molecule to tunnel through to the emitter. However, the neutral molecule may approach closer than a certain minimum distance which depends on the field, the ionization potential of the molecule and the work function of the emitter surface. There is no further possibility for the electron to tunnel into the emitter metal, since the ground level of the molecule then sinks below the Fermi level of electrons in the emitter.

Further information was obtained from a simple mass spectrometer which uses a field ion emitter as a point source of remarkable intensity. Experiments with hydrogen gas indicate the formation of  $H^+$  and  $H_2^+$  ions at the emitter. The relative abundance of these ions, about 1:1, was found, in this arrangement, to be independent of the field strengths at the emitter and the gas pressures in the spectrometer tube.

Extensive studies with the ion microscope using various inert gases as well as nitrogen and oxygen show that the resolving power depends not only on tip radius, polarizability and ionization potential of the gas molecules, but also on the accommodation coefficient of gas and emitter metal combination. These observations agree with the conclusions derived from the other experiments mentioned above and with the theoretical derivation of the resolving power. A helium operated microscope gives the best resolution, particularly when the emitter is cooled to increase the accommodation coefficient. A resolution of about 3 Å is achieved which is sufficient to resolve single atoms on the surface lattice of the tungsten emitter.

Finally, preliminary experiments with nitrogen operated desorption microscope using pulses are described.

## VITA

Kanwar Bahadur was born in Simla, India, April 13, 1925. He entered the Delhi University in May 1940. He received his B. S. degree in Physics and Mathematics in April 1944 and the M. S. degree in Physics in April 1946. For some time he worked in the Radio Institute, New Delhi and the All India Radio, Delhi. He joined the National Physical Laboratory of India in September 1950, as a research assistant. He entered the graduate school in Physics at The Pennsylvania State University, September 1953.

77 pages. \$1.00. Mic 56-2306

**THE EFFECT OF VISCOSITY AND  
DIELECTRIC CONSTANTS ON  
HEMOGLOBIN AND CATALASE REACTIONS**

(Publication No. 16,702)

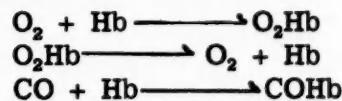
Robert Lewis Berger, Ph.D.  
The Pennsylvania State University, 1956

Apparatus is described for the measurement of enzyme reaction rates, whose half-lives are greater than one millisecond, over a range of viscosities from 1 to 200 centipoise. The reaction rates are studied in a flow apparatus similar to that of Chance using a Beckman Model DU spectrophotometer with an overall stability of  $10^{-5}$  optical density units.

The diffusion coefficients and solubilities of oxygen were determined at the dropping mercury electrode. Plots of  $D_{Fick}$ , the Fick diffusion coefficient, versus  $\eta^{-1}$ , the viscosity in poises $^{-1}$ , did not yield a Stokes-Einstein relation; i.e.,  $D_{Fick} \eta = \text{constant}$ . A new diffusion coefficient,  $D_\alpha$ , has been defined such that  $D_\alpha = \frac{D_{Fick}}{f^2}$  where  $f$  is the

activity coefficient of oxygen and is equal to the ratio of the concentration of oxygen in pure water to that in the several media. The driving force of diffusion is taken as the activity gradient. It was found that  $D_\alpha \eta = \text{constant}$  held from 1.5 to 120 centipoise in sucrose-water mixtures, and from 2 to 120 centipoise in glycerol-water mixtures. An interpretation is given in terms of the hole theory of liquids.

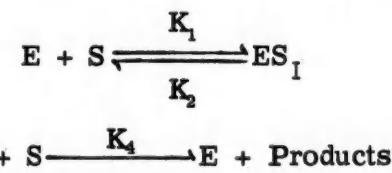
The three hemoglobin reactions



were determined in water, 30 and 70 centipoise sucrose, glycerol, and methocel. These reactions have half-lives, at the concentrations used, of about 0.05 - 1 second. No change in the specific rate constants were found for any of the three reactions within  $\pm 10\%$ . The partial molal entropy for oxygen and carbon monoxide in solution was calculated. The theoretical loss of entropy upon reaction was compared to the entropy of activation calculated, on the basis of absolute rate theory, from the experimental specific rate constants and activation energies, and was found to have qualitative agreement only if a molecule, or molecules, of water were assumed to take part in the reaction as suggested by Keilin, Hartree, and Haurowitz. Using a probability-encounter theory, the cross-section of the

active-site is computed as greater than or equal to  $100 \text{ } \overset{\circ}{\text{A}}^2$  for the oxygen reaction and greater than or equal to  $5 \text{ } \overset{\circ}{\text{A}}^2$  for the carbon monoxide.

The breakdown of hydrogen peroxide by catalase was also observed in the same several media as the hemoglobin reactions. The reactions are as follows:



The observations were made at both 405 and 230 millimicrons. The rate constant,  $K_4$ , of the breakdown of hydrogen peroxide-catalase complex I upon combination with a second hydrogen peroxide molecule to give free enzyme and products, was found to decrease in a manner approximately in proportion to the Fick diffusion coefficient. A value for the cross-section of the active-site of the complex was computed to be between 2 and  $10 \text{ } \overset{\circ}{\text{A}}^2$ .

The rate constants,  $K_1$  and  $K_2$ , for the forward and backward formation of the hydrogen peroxide-catalase complex I increased by a factor of about 10 from water to 70 centipoise sucrose or glycerol. This corresponds to an active-site cross-section greater than or equal to  $100 \text{ } \overset{\circ}{\text{A}}^2$ . The ratio of  $P/Q$ , where  $P$  is the amount of hydrogen peroxide-catalase complex I and  $Q$  the amount of free enzyme present, also increased in the more viscous media. An interpretation is offered on the basis of more sites becoming available to the hydrogen peroxide due to slight dehydration of the protein and the water molecule theory of the hemoglobin reactions.

This work has shown the value of the methods of investigation used. Varying the viscosity of the suspending medium permits an elucidation of the physical mechanism of reaction. In addition, the diffusion measurements have pointed to new possibilities for studies of the kinetic theory of liquids.

## VITA

Robert Lewis Berger was born in Omaha, Nebraska, on September 2, 1925, and was graduated from Central High School, St. Joseph, Missouri, in 1943. He spent four years as a Radio Officer in the United States Merchant Marine. His Bachelor of Science degree in Physics was awarded in 1950 by Colorado A & M College, Fort Collins, Colorado. The next year he held the position of Instructor in Physics at Park College, Parkville, Missouri.

He received the Master of Science degree in Physics in 1953 and the Doctor of Philosophy in Physics in 1956 from The Pennsylvania State University. During part of his graduate career he was a Graduate Assistant in Physics; the rest of the time was spent as the recipient of an American Cancer Society fellowship. In 1956 he conducted post-doctoral research at Cambridge University as a British-American Exchange Fellow of the American Cancer Society as Recommended by the Committee on Growth of the National Research Council.

Mr. Berger is a member of Sigma Xi, the American Physical Society, the New York Academy of Science, the Acoustical Society of America, the American Association of Physics Teachers, and the Society for the Social Responsibility of Science. 103 pages. \$1.50. Mic 56-2307

SPECTRAL REFLECTANCE OF SOLIDS  
FOR ALUMINUM K-RADIATION

(Publication No. 16,846)

Roy Wesley Hendrick, Jr., Ph.D.  
Stanford University, 1956

The reflectance of aluminum x-radiation from flat glass, magnesium, aluminum, copper, silver, and gold surfaces was measured as a function of the angle of grazing incidence. A single vacuum chamber 8 by 12 by 24 inches housed the x-ray tube, reflector, aluminum absorption filter, radiation detector and a metal-evaporation unit. The metal surfaces were deposited by evaporation from a hot filament onto glass flats which were already positioned in the measuring equipment, and immediately thereafter, the reflectance was measured.

The x-ray tube had a 0.01 inch diameter aluminum wire anode which was operated at a 2800 volt accelerating potential. This 2 centimeter long anode wire successfully dissipated 2.6 watts. A finer, 0.003 inch, tungsten anode could dissipate 4.3 watts. The output intensity was stabilized by the combination of a constant supply potential and a series resistance which matched the "dynamic output impedance" of the tube. In this way, variations in output were made a second order function of tube current fluctuations, a ten per cent current change producing less than a one per cent output change. An aluminum filter absorbed most of the radiation except the characteristic lines. The detected radiation was about 98 per cent  $K\alpha$  radiation and 2 per cent  $K\beta$ .

A CeBr(Th) scintillator and 6199 photomultiplier detected the x-rays. Cooling the photomultiplier, and incidentally the crystal, reduced the thermal noise but, when using liquid nitrogen coolant, also induced long time-constant phosphorescence of the scintillator. Components with time constants of 45 and 230 seconds accounted for about a third of the recorded output. However, this phosphorescence was absent when cooling with ice, and yet the thermal noise was only 0.3 per cent of the maximum signal.

A special six-bar half-angle linkage connected the detector to the reflector mount causing the detector to track the reflected beam. The particular linkage used had the advantage of requiring no sliding contacts.

Table I

Material and thickness Angstroms	Critical angle - milliradians			Absorption ratio	
	Experimental	Schon	Theoretical	Experimental	Theoretical
Glass 00	20.0	20.5	20.4	0.11	0.088
Magnesium 100			16.2		0.341
Aluminum 390	17.1		18.3	0.11	0.036
716			18.0	0.05	
2500			18.7	0.05	
				0.06	
Copper 100			34.0		0.353
200	29.5			0.46	
	31.0			0.42	
Silver 100			36.0		0.193
300	32.7			0.39	
	34.0			0.37	
Gold 210			41.2		0.241
424	39.0			0.33	
	35.5			0.31	

Table I lists the experimental results in terms of the parameters critical angle and absorption ratio. Included for comparison are critical angles measured by Schon,\* theoretically computed critical angles, and absorption ratios based upon accepted absorption coefficients and the theoretical critical angles.

Excluding two anomalous cases, the experimental critical angles were  $9.3 \pm 1.4$  per cent less than the theoretically calculated values and absorption ratios  $28.2 \pm 3.1$  per cent more. (The variations indicated are the experimental standard deviations and are almost identical to the estimated equipment accuracy.) A reduced material density in the deposited film could account for the small critical angles, but no simple explanation was conceived to account for the absorption discrepancy. The positions of interference extremes in the reflection from the thin aluminum films substantiated a revised interference theory which corrects for the phase shift upon reflection.

176 pages. \$2.30. Mic 56-2308

\*Schon, M., "Über Totalreflexion Langwelliger Röntgenstrahlung," Zeitz. f. Physik 58, 3-4; 165 (October 1929).

THE DIRECT MEASUREMENT OF THE RATIO  
OF THE THERMAL CONDUCTIVITY  
TO THE ELECTRICAL CONDUCTIVITY OF METALS  
AT LIQUID HELIUM TEMPERATURES

(Publication No. 16,689)

Walter John Shattes, Ph.D.  
Rutgers University, 1956

The Kohlrausch method for measuring the ratio of the thermal conductivity to the electrical conductivity of metals has been successfully applied to measurements at liquid helium temperatures. In this method the sample, in wire form, is placed in a vacuum calorimeter in such a way that both ends of the specimen are in thermal contact with the helium bath. When an electric current is sent through the sample, the Joule heat establishes a temperature gradient between the center and ends of the wire. It can be shown that in the steady state the ratio of the thermal to the electrical conductivity,  $K/\sigma$ , is given by  $K/\sigma = V^2/8 \Delta T$ , where  $V$  is the potential drop across the sample and  $\Delta T$  is the temperature difference between the center and ends. This expression is valid only when the ratio  $\Delta T/T$  is kept small. The Lorentz number,  $L = K/\sigma T$  can be obtained by dividing both sides of the above equation by  $T$ .

The temperature is measured with composition carbon resistance thermometers. One thermometer is attached to the center of the sample, and is used to measure the change in temperature at this point caused by the Joule heating. The second thermometer is in thermal contact with both ends, and detects the small rise in temperature at these points when current is flowing.  $\Delta T$  can then be obtained by subtracting the temperature rise measured by the end thermometer from the difference in temperature measured by the center thermometer. The voltage,  $V$ , is measured with a potentiometer.

Measurements were made on copper, silver and gold specimens. At each temperature  $\Delta T$  was determined for

several values of current. The slope of the curve of  $V^2$  vs.  $8\bar{T}\Delta T$ , where  $\bar{T}$  is the average temperature of the specimen when current is flowing through it, then gave a value of  $L$ . Finally  $L$  was plotted against  $T$ . Since both silver and copper are very good conductors, as is to be expected the Lorentz numbers for these samples in the liquid helium temperature range were found to be constant and in good agreement with the theoretical value,  $L_0 = 2.44 \times 10^{-8}$  (volts/ $^0K$ ) $^2$ . The average value for copper was  $2.436 \times 10^{-8}$  (volts/ $^0K$ ) $^2$  and the values obtained for the two runs on silver were  $2.439 \times 10^{-8}$  (volts/ $^0K$ ) $^2$  and  $2.433 \times 10^{-8}$  (volts/ $^0K$ ) $^2$ . The scatter of the data points from these average values was very small.

The gold sample showed a linear increase of  $L$  with increasing  $T$ , indicating that for this specimen the lattice thermal conductivity is not negligible. It was found that for this sample the lattice thermal conductivity,  $K_g$ , could be expressed as  $K_g = 7 \times 10^{-4}T^2$ , in good agreement with the theoretical expression,  $K_g = 8 \times 10^{-4}T^2$ .

40 pages. \$1.00. Mic 56-2309

#### THE ABSORPTION OF SOUND IN ARGON, NITROGEN, AND CARBON DIOXIDE AT TEMPERATURES BETWEEN 0 AND 200° C

(Publication No. 17,108)

Fletcher Douglas Shields, Ph.D.  
Vanderbilt University, 1956

Supervisor: Professor Robert T. Lagemann

The attenuation of a plane sound wave as it passes through a gas enclosed in a tube was treated by Kirchhoff over a century ago. Experimental measurements of sound absorption at room temperatures have generally confirmed his theoretical equations as to the variations of the absorption with the sound frequency and gas pressure. There is, however, some discrepancy between the magnitude of the absorption found experimentally and that predicted by Kirchhoff. As an additional source of uncertainty there have been few measurements to check the theory at other than room temperature.

In certain polyatomic gases a relaxation effect causes the absorption to be much larger than that predicted by Kirchhoff. This abnormal absorption is attributed to a failure of the internal molecular energy to stay in phase with the pressure changes in the sound wave. Measurements of the sound absorption in such gases can be interpreted theoretically to give valuable information concerning the intermolecular collision process.

In order to investigate these absorption phenomena a system has been developed which makes possible the measurement of the absorption and velocity of sound in gases under carefully controlled conditions of temperature and pressure. The sound frequency can be varied from 2 to 11 K.C., the pressure from 0.3 to 30 cm. of Hg. and the temperature from 0 to 200° C. The measurements are made in a precision-bore pyrex glass tube 1.73 cm. in diameter. This tube encloses a movable sound speaker and a stationary receiver. Both the speaker and receiver employ the principle of a ribbon microphone, the magnetic field being applied from outside the tube by permanent

magnets. One avoids producing standing waves by making the receiver ribbon only 0.07 cm. wide and terminating the sound path with cones of pyrex wool. This apparatus has been used to measure the classical absorption in argon and nitrogen and the relaxation absorption in carbon dioxide.

The results on argon and nitrogen remove a great deal of the uncertainty as to the validity of the Kirchhoff equations which correctly predicted the absorption and velocity.

On the basis of these results, the Kirchhoff equations can be used, in the case of gases exhibiting relaxation phenomena, to correct the measured absorption and isolate that part due solely to relaxation. Thus the relaxation absorption in carbon dioxide has been investigated over the temperature range from 0 to 200° C to an extent heretofore possible only at room temperatures. The following conclusions can be drawn from the results of the measurements on carbon dioxide:

- (a) The relaxation and tube absorption are additive.
- (b) For the frequencies and pressures here employed the relaxation absorption and velocity effects are a function of  $f/p$ . This means that only binary collisions are effective in transferring energy between the vibrational and translational modes.
- (c) The relaxation theory with a single relaxation time for all the vibrational modes adequately predicts the observed absorption and velocity in the temperature range from 0 to 200° C. It is estimated that a separation in the relaxation times of the two lowest modes by a factor of more than 2 could not have gone undetected.
- (d) The results confirm the Landau and Teller expression for the variation of the collision efficiency with temperature. This indicates that the probability of the transfer of energy between translation and vibration in a molecular collision is proportional to the velocity of the colliding molecules.

88 pages. \$1.50. Mic 56-2310

#### VIBRATION SPECTRA OF POLYETHYLENES AND LONG-CHAIN PARAFFINS

(Publication No. 16,986)

Albert Haines Woollett, Ph.D.  
The University of Oklahoma, 1956

Supervisor: Professor J. Rud Nielsen

Several investigators have obtained infrared data for compounds containing long methylene chains, but very few have reported Raman data for such compounds. The aims of the present work have been to obtain Raman data for some long-chain paraffins and for polyethylenes and to interpret the infrared and Raman spectra of the highly crystalline polyethylene, Marlex 50.

In spite of the great difficulties in observing the Raman spectra of such materials, rather complete Raman data were obtained for solid  $n-C_{28}H_{58}$ ,  $n-C_{36}H_{74}$ , Venezuela wax, stearic acid, Marlex 20, and Marlex 50. The band near  $890 \text{ cm}^{-1}$ , which is prominent in the Raman spectra of short-chain paraffins, was not observed in the Raman spectra of the polyethylenes. On the other hand, two new bands were found for most of the compounds. Repeated

attempts to obtain the Raman spectra of some of these compounds in the liquid state were largely unsuccessful on account of background. Only for liquid Venezuela was there any bands observed other than those associated with stretching of the carbon-hydrogen bonds. An improved infrared spectrum of Marlex 50 was obtained with a double-pass spectrometer having NaCl and LiF prisms.

It is assumed that the crystalline phase of Marlex 50 has the space group  $V_h^{16}$  and the same unit cell as determined for another polyethylene by Bunn.<sup>1</sup> Spectral activities of the symmetry vibrations are derived by the space group method of treating molecular crystals developed by Bhagavantam and Venkatarayudu,<sup>2</sup> Winston and Halford,<sup>3</sup> and Hornig,<sup>4</sup> and extended by Tobin<sup>5</sup> to crystals of long-chain molecules. This analysis yields eight Raman-active fundamentals, five infrared-active fundamentals, and one inactive fundamental for the polymethylene chain. Two chains pass through each unit cell, and two closely spaced unit cell fundamentals correspond to each chain fundamental. It is a well-known experimental fact that two of the strong infrared bands of methylene chain compounds become doublets in the crystalline state. A similar splitting has not been observed for other bands of these compounds. Thus, most of the observed bands must be regarded as accidentally doubly degenerate. Four of the infrared-active fundamentals have been assigned by previous workers. The Raman active unit cell fundamentals of crystalline Marlex 50 are assigned as follows: species  $a_g$  and  $b_{1g}$ : 1061, 1168, 1440, 2848 cm<sup>-1</sup>; species  $b_{2g}$  and  $b_{3g}$ : 1131, 1295, 1415, 2883 cm<sup>-1</sup>.

In terms of these unit cell fundamentals it has been possible to interpret all but nine very weak bands of the sixty observed infrared bands of Marlex 50. The interpretations of several combination bands violate the  $u-g$  selection rule. It is assumed, therefore, that these bands are combinations of non-unit cell fundamentals having equal and probably very small wave number vectors. Consideration of combination bands did not yield any definite information about the unknown  $b_{1u}$  and  $a_u$  fundamentals.

98 pages. \$1.50. Mic 56-2311

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#### ON THE TIME OF ADSORPTION OF CESIUM IONS DERIVED FROM CESIUM HALIDE MOLECULES

(Publication No. 16,669)

Jay Norman Zemel, Ph.D.  
Syracuse University, 1956

It is well known that cesium halide molecules will dissociate on the surface of a glowing tungsten filament and that the cesium atom can be emitted thereafter as an ion. It has been observed by earlier investigators that a time lapse exists between the dissociation of the molecule and the emission of the ion.

The time of adsorption,  $\tau$ , depends on the temperature,  $T$ , and the heat of adsorption,  $Q$ , as

$$\tau = \tau_0 \exp \left\{ Q/RT \right\} \quad (1)$$

where  $k$  is the Boltzmann constant and  $\tau_0$  is a time related to period of the ion on the surface. By studying the temperature dependence of the adsorption time, it is possible to obtain the heat of adsorption and thereby obtain information concerning the interactions between the solid and the ion.

The experiment employed a pulsed molecular beam so that the decay of the ion current from a hot tungsten wire could be conveniently observed. The decay constant of the ion current was shown to be related to the time of adsorption of the ion. Three different molecular species were studied and the heats of adsorption calculated for the cesium ion from the data. It was found that no appreciable difference existed between the values for the time of adsorption and the heat of adsorption for the three molecules. The values for the heat of adsorption were found to be

CsCl	CsBr	CsI
1.56 e.v.	1.58 e.v.	1.65 e.v.

with an estimated error of less than 50%. These values are in agreement with the findings of earlier investigators to within the experimental error of the measurement. It was observed that the time of adsorption of the cesium ions are quite sensitive to the presence of other adsorbed atoms or molecules. In addition, the adsorption time was found to be dependent on the applied field.

An extension of the Chandrasekhar theory of the escape of a particle from a potential well due to thermal excitation is presented which can qualitatively explain the observed phenomena. 102 pages. \$1.28. Mic 56-2312

#### PHYSICS, ELECTRONICS AND ELECTRICITY

##### MICROSEISMIC AZIMUTHS

(Publication No. 16,930)

Palmer W. Carlin, Ph.D.  
University of Colorado, 1955

Supervisor: Professor Frank C. Walz

The earthquake seismologist is interested in the motion of the earth due to the passage of occasional traveling waves caused by earthquakes. If his seismograph is made more and more sensitive, a point will eventually be reached which shows a continuous unrest or slow vibration of the earth's surface. The waves causing this movement, called microseisms, are believed to be traveling surface waves analogous to the swell on the surface of the ocean, and their study constitutes a division of growing importance in seismology.

One of the techniques recently devised to study the direction of approach of these microseisms is the tripartite network of stations. As the name suggests, three seismographs are placed at the corners of a triangle and by a

comparison of their records, the order of arrival of a given wave crest among the stations can be found. From this its direction of approach can be found. This comparison has always been done visually and has, therefore, certain faults:

1. Accuracy of phase differences is limited by the measurements made on the seismogram and readings are never better than one significant figure.
2. Direction determination can never be made until after the seismogram has been processed photographically. Thus, these directions cannot be used to control other experiments, such as simultaneous resolution of earth motion in selected directions.
3. Calculations are tedious and time consuming and are doubly so if phase velocity of each wave is to be computed also.

The primary purpose of the work outlined by this paper was to construct and operate a simple computer which would accept the three seismic signals of the tripartite network and yield instantaneously wave direction and phase velocity. These data were collected in easily usable form as graphs on photographic film.

The computer was in operation for about two months, and enough data were recorded to indicate that days of low microseismic activity show no consistent direction. Consistent directions toward an atmospheric low over the Gulf of Saint Lawrence were found on a day of high activity.

Sources of and effect of seismograph non-uniformity were considered.

An experimental comparison of the tripartite method of direction determination with direction determination by phase comparison among three components was made.

137 pages. \$1.85. Mic 56-2313

#### BAND THEORY OF GRAPHITE

(Publication No. 16,691)

John Casimir Slonczewski, Ph.D.  
Rutgers University, 1955

Supervisor: Dr. P. R. Weiss

Theory and experiment indicate that the electronic properties of graphite depend on the  $\pi$ -band energy surfaces in only a small region of the Brillouin zone. In this work, solution of the Schrödinger equation is not attempted. Instead, perturbation theory is used to expand the energy in a series of powers of the wave vector in this region. Group theory is used to deduce the restrictions imposed on the energy surface by the symmetry of the lattice.

The sequence of approximations considered and the results of each are listed below; unqualified assertions about the energy surface are independent of the precise nature of the crystal field assumed in each case:

(1) A graphite layer is assumed to be uninfluenced by the presence of any other layers. It is found that the filled  $\pi$ -band must touch the empty  $\pi$ -band at each corner of the 2 dimensional hexagonal zone. At each corner the energy surface must be a circular cone to the first order in the wave vector. The slope of the cone equals  $hp_0/2\pi m$

where  $p_0$  is the expectation value of momentum for a state whose wave vector is at the touching point. Assuming this state to be a linear combination of atomic hydrogen-like  $p_z$  orbitals,  $2\pi p_0/h$  is estimated to be  $.63 \times 10^8 \text{ cm.}^{-1}$ . No plausible argument for overlap of the bands can be advanced.

(2) If the electrostatic field of the neighboring layers is allowed to perturb the single layer Bloch states, it produces a splitting of the  $\pi$ -bands in the 2 dimensional zone.

(3) The Bloch function in the 3 dimensional lattice is written as a linear combination of single layer Bloch functions. To a first approximation, there are two possible results, depending on the crystal field: (a) The conduction and valence bands touch along a portion of the edge of the hexagonal zone without overlapping, or (b) the bands are separated by a gap. In this approximation, simple formulae relate variable basal components of effective mass to  $p_0$  and certain energy differences.

In case (a) higher approximations result in two kinds of overlap. Results of published tight binding calculations conform to the general results of this work. However, one of the two possible kinds of overlap has not been pointed out before.

Spin-orbit coupling is estimated to split the touching point energy by less than  $10^{-4}$  electron volts.

145 pages. \$1.81. Mic 56-2314

#### PHYSICS, NUCLEAR

##### REACTIONS OF 378 MEV PROTONS WITH ARSENIC

(Publication No. 17,094)

James Burton Cumming, Ph.D.  
Columbia University, 1954

Targets of arsenic metal or arsenic compounds have been bombarded with 378 Mev protons in the circulating beam of the Nevis cyclotron. Following chemical separation of the products into elemental fractions from potassium to selenium, the relative yields of more than 60 radioisotopes were determined by absolute beta and X-ray proportional counting. The absolute cross sections for forming several of these products were measured by comparison of their formation rates with the formation rate of  $\text{Na}^{24}$  from Al in a target containing a known ratio of arsenic to aluminum atoms. The total inelastic cross section of arsenic (including interpolated values) is estimated to be  $870 \pm 180 \text{ mb}$ .

The distribution of products is similar to that observed for  $\text{Co}^*$  and supports the two step picture of high energy nuclear reactions. The initial nucleonic cascade leads to one of several excited nuclei which then evaporate particles to give the observed products.

The experimental yield curve is combined with evaporation theory\*\* to give the spectrum of excitations transferred in the cascade step. This is compared with the predictions of the Monte Carlo calculation\*\*\* and of a simplified model. Qualitative agreement is obtained, however none of the present models satisfactorily explains

the formation of products thirty or more mass units removed from the target. 103 pages. \$1.50. Mic 56-2315

\* E. Belmont, thesis, Columbia University, 1952.

\*\* K. J. Le Couteur, Proc. Phys. Soc. A63, 259 (1950).

\*\*\* G. Bernardini, E. T. Booth, and S. J. Lindenbaum, Phys. Rev. 88, 1017 (1952).

#### A SEARCH FOR FINE STRUCTURE IN THE GIANT RESONANCE

(Publication No. 17,000)

Duncan Graham Foster, Jr., Ph.D.  
Cornell University, 1956

Previous investigations of the photonuclear cross sections of light elements have revealed the presence of fine structure within the "giant dipole resonance." This experiment represents an attempt to extend such investigation to somewhat heavier elements, by using monochromatic gamma radiation and improved energy resolution.

The 17.6 Mev gamma rays from the 440 kev resonance in the  $\text{Li}^7(\text{p}, \gamma)\text{Be}^8$  reaction were used. Energy variation, over a range of 120 kev, was achieved by taking advantage of the Doppler effect. Photoneutrons emitted from the sample were thermalized in a block of paraffin, and detected with proportional counters filled with enriched  $\text{BF}_3$ . The counters were constructed of thin aluminum to reduce the background due to photoneutrons generated in them by the gamma radiation. The energy resolution attained was approximately 20 kev.

Most of the measurements were carried out on toroidal samples coaxial with the proton beam. To investigate the possibility of systematic errors arising from the use of this arrangement, however, additional measurements were made using rectangular samples, maintained at a fixed distance from the source.

The elements Pb, Cu, Si, Al, Mg, Na, and O were examined, but for oxygen only the order of magnitude of the cross section was determined. The neutron yields obtained ranged from more than three times background (Pb) to less than one-tenth of the background (Si and Na). Consequently, the statistical error varied from 1% to more than 5%. In addition, systematic errors in the shape of the curves of cross section vs. energy may be present, varying in magnitude from negligible to more than 25%. The largest systematic errors are expected to arise from absorption of background neutrons in the samples.

The absolute cross sections, referred to Cu as standard, are in satisfactory agreement with those obtained by others, except for the cross section of Si, which is also suspected of a large systematic error in the shape of the curve. Most of the cross sections show little or no fine structure. Among the results of special interest are the following:

- (1) The cross section of Cu appears to be constant within 1%, in contrast to the 10% variation reported in the literature, but a 9% fluctuation is observed in Al.

(2) The cross section of natural Mg decreases by 40% for an increase of 120 kev in photon energy. A small, sharp peak at 17.625 Mev is attributed to a level in  $\text{Mg}^{24}$ , with a radiative width of about 3 ev and a total width of less than 15 kev. This level may coincide with one observed in the  $\text{Na}^{23}(\text{p}, \text{n})\text{Mg}^{23}$  reaction.

(3) The recently reported level in  $\text{O}^{16}$ , at approximately 17.575 Mev, is not observed within the range 17.567 to 17.607 Mev.

In view of the restricted energy range accessible, and of the very high background with its attendant possibility of serious errors, the method used does not seem to offer promise as a general technique for investigation of fine structure in the giant resonance.

90 pages. \$1.50. Mic 56-2316

#### MEASUREMENTS OF THE CROSS SECTION FOR PAIR PRODUCTION NEAR THRESHOLD IN LEAD

(Publication No. 17,002)

Thomas Llewellyn Jenkins, Ph.D.  
Cornell University, 1956

Measurements have been made of the electron pair cross section at gamma ray energies of 1.12, 1.33 and 2.76 Mev., using the radiation from  $\text{Sc}^{46}$ ,  $\text{Co}^{60}$ , and  $\text{Na}^{24}$ , respectively. The method of detecting the pairs consisted of detecting the annihilation radiation produced by the positrons. Two NaI(Tl) scintillation counters, each about 4 centimeters thick and 4 centimeters in diameter, were placed on opposite sides of a cylindrical lead target. All the positrons produced were stopped and annihilated in the target. The annihilation radiation emanating from the target was detected by counting coincidences between these two counters.

In order to determine the absolute pair cross section, one must know, in addition to the counting rate measured by the above scheme, the detection efficiency of the apparatus and the intensity of the photon beam incident upon the target. The method of calibrating the pair detection apparatus consisted of placing a small positron source ( $\text{Na}^{22}$ ) of known activity inside a lead cylinder which mocked up the lead target. Counting the coincidences produced by a known number of positrons in a geometry identical to that in which the pairs were counted, the detection efficiency could be calculated.

The beam of photons incident upon the target was measured by placing two 1 centimeter thick NaI(Tl) scintillation counters in the beam. Counting rates in these two crystals were measured when both were in the beam and when each was in the beam separately. The counting rate in the first crystal was equal to  $I_0 e_1$  where  $I_0$  is the intensity of the beam and  $e_1$  is the detection efficiency of the first crystal. When the second crystal was in the beam alone, its counting rate was  $I_0 e_2$ , where  $e_2$  is its detection efficiency. If one assumes that the attenuation of the beam produced by the first crystal was equal to its detection efficiency, i.e., that it counted all the photons that it absorbed, then the counting rate in the second crystal when both crystals were in the beam was  $I_0 e_1 e_2$ . Errors arising because of the incorrectness of this assumption could be

calculated and corrected for. Knowing these three counting rates one can then calculate  $I_0$ . It was not possible to apply this method directly to the beam used in the pair detection measurements because of its high intensity. Measurements on a beam several hundred times weaker were made and the ratio of the intensities of the two beams was determined.

The cross sections measured in this experiment were  $(1.114 \pm .093) \times 10^{-26} \text{ cm}^2$ ,  $(2.64 \pm .15) \times 10^{-25} \text{ cm}^2$ , and  $(3.40 \pm .23) \times 10^{-24} \text{ cm}^2$  at 1.12, 1.33, and 2.76 Mev., respectively. These results are higher than the cross sections predicted by the Bethe-Heitler theory by 104%, 136%, and 22%, respectively. They are in fair agreement with the results of other workers.

42 pages. \$1.50. Mic 56-2317

#### GAMMA RAYS FROM THE $\text{Si}^{29}(p,\gamma)\text{P}^{30}$ REACTION

(Publication No. 17,395)

Salvatore Milani, Ph.D.  
The Ohio State University, 1956

Protons from the Ohio State University Van de Graaff accelerator were used to study two unrelated problems. The first problem was concerned with the  $\text{Si}^{29}(p,\gamma)\text{P}^{30}$  reaction. The resonances in the reaction were studied, the gamma-ray energies from the excited  $\text{P}^{30}$  nucleus were measured, and the half-life of  $\text{P}^{30}$  was determined. The second problem dealt with the measurements of the proton-stopping cross sections of gases. Measurements were made on nitrogen, xenon, air, carbon dioxide, water vapor, and benzene in the energy range from 400 Kev to 1000 Kev.

A study of the  $\text{Si}^{29}(p,\gamma)\text{P}^{30}$  reaction is of great interest in nuclear physics since the product nucleus,  $\text{P}^{30}$ , is one of the  $4n+2$ , odd-odd,  $N=Z$  nuclei which are favorable subjects for the study of isotopic spin. These nuclei are the only ones which have more than one isotopic spin quantum number in their low-lying states. The silicon was obtained from the Oak Ridge National Laboratory in the form of  $\text{SiO}_2$  enriched to 80.8 per cent  $\text{Si}^{29}$ . A thick target was prepared by compressing the material into a holder one-half inch in diameter with a hydraulic press. Six thin targets varying in thickness from 3 to 15 Kev were prepared by evaporating the material on tantalum blanks. A well-type NaI(Tl) scintillation counter was used to determine the resonances for both the thick and the thin targets. In addition to the previously reported resonances at 326 and 414 Kev, four new resonances were found in the proton energy range from 300 Kev to 1.3 Mev. They were found at 698, 731, 918, and 957 Kev. All of the resonances were narrow, having a full width at half-maximum of less than 2 Kev. The gamma-ray energies were measured for the new resonances and also for the 414 Kev resonance. A single crystal NaI(Tl) scintillation spectrometer was used which had a resolution of 10.5 per cent. The photographic method was used to analyze the spectra. From the observed spectra of these resonances, evidence was obtained for the existence of energy levels in  $\text{P}^{30}$  at .69, 1.45, 1.95, 2.46, 2.94, 4.43, 4.66, 5.85, 5.93, 6.21, 6.24, 6.42, and 6.46 Mev. The energy level diagram of  $\text{P}^{30}$  was compared with the  $\text{Si}^{30}$  diagram after the Coulomb correction had been made. This indicated that the energy levels having  $T = 0$

are the ground state, 1.45, 1.95, 2.46, and 5.93, while .69, 2.94, 4.43, 4.66, and 5.85 are the levels having  $T = 1$ . The half-life of  $\text{P}^{30}$  was measured by bombarding a thin target at the 698 Kev resonance and counting the .51 Mev annihilation radiation. A single channel analyzer was used to lower the background rate. A half-life of  $2.55 \pm .05$  minutes was observed.

The proton-stopping powers of gases were determined by observing the energy loss suffered by the protons in traversing the gas which was at a known temperature and pressure. The protons entered the chamber through a foil which was prepared by evaporating a layer of silver on a Formvar film. In the case of air, a coating of LiF was evaporated over the silver to prevent oxidation. The pressure of the gas was measured with an oil manometer, and the temperature was measured with a thermometer which was in contact with the walls of the chamber. The proton beam was calibrated with the known resonances in LiF, and the loss in energy was measured by noting the displacement of these resonances. The results are given in tabular and graphical form and are in good agreement with previously reported work. In the case of xenon, the data were ten per cent higher than those reported by Chilton. Bragg's law was found to be valid within experimental error.

141 pages. \$1.90. Mic 56-2318

#### THE USE OF PELLICLE STACKS TO STUDY HIGH ENERGY NUCLEAR INTERACTIONS

(Publication No. 16,982)

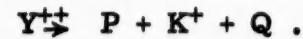
Charles H. Skeen Ph.D.  
The University of Oklahoma, 1956

Co-chairmen: Prof. Robert A. Howard  
Prof. William Schriever

Charged particles can be detected by means of nuclear emulsions because they render the silver salts through which they pass developable. Pellicles are unsupported photographic emulsions. They have an advantage over ordinary glass supported emulsions in that one can make a continuously sensitive volume of any desired size by suitably arranging stacks of such pellicles. The author undertook to modify the equipment and procedures already in use in the cosmic ray laboratory at The University of Oklahoma to handle pellicle stacks. After exposing and processing 3 stacks, it was concluded that a satisfactory procedure for their handling had been established.

After processing a stack of pellicles, the individual pellicles were scanned for events of interest. The author was particularly interested in finding hyperons and hyperfragments. A hyperon is a "fundamental" particle whose mass is greater than that of a proton. All previously reported hyperons have been electrically neutral or singly charged. Hyperfragments are usually defined as being nuclei containing a bound hyperon.

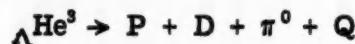
While scanning the pellicles which were processed in January of 1955, the author found an event which was interpreted by the author as:



This would correspond to the decay of a doubly charged

hyperon into a proton and a heavy meson. The Q-value was found to be  $4.2 \pm 0.5$  Mev and the mass  $2812 \pm 0.8 M_e$ . This mass value is rather close to the value  $2830 M_e$  reported by Y. Eisenberg<sup>1</sup> for a singly charged hyperon. It is possible, therefore, that it represents a different charge state of the particle found by Eisenberg.

An event interpreted as:



was discovered while scanning a stack of pellicles processed in September of 1955. The Q-value was  $34.6 \pm 1.8$  Mev. If this result is substantiated by other events, then the postulate of charge independence of the forces binding hyperons to nuclei will have to be abandoned. It must be emphasized that the interpretation given above is not unique. The primary particle could be a heavier nucleus such as He<sup>4</sup> or Li<sup>6</sup>, but in these cases one would have to assume that two or more neutral particles were emitted in the decay process in order that momentum be conserved.

74 pages. \$1.50. Mic 56-2319

1. Y. Eisenberg, Phys. Rev. 96, 541 (1954).

#### SPIN ECHO DETERMINATION OF RELAXATION TIMES

(Publication No. 16,943)

James Taylor Smith, Ph.D.  
University of Colorado, 1955

Supervisor: Assistant Professor Wesley E. Britten

If two radio frequency pulses at known time intervals are used to generate an oscillating magnetic field within a sample of nuclei located in a region of a large static magnetic field, and if the radio frequency of the pulses coincides with the Larmor precessional frequency of the nuclei, there occur changes in the magnetization of the sample which in turn give rise to the phenomenon known as "spin echoes."

Relaxation is related to the adjustment of a system to a sudden change in conditions. Spin-lattice relaxation time,  $T_1$ , refers to the time that it takes for a sample whose equilibrium magnetic energy state has been disturbed to return to equilibrium.

A new method, "memory damping," for measuring the spin-lattice relaxation time,  $T_1$ , is described and compared experimentally with previous methods. This method is used to measure  $T_1$  for various mixtures of ethanol and water.

An anomaly was found for the aqueous solution of ethanol. The first part of a curve of  $T_1$  versus the percentage of ethanol by weight follows the general law:  $T_1 \propto 1/C_E$  ( $C_E$  is the concentration of ethanol). As the concentration of ethanol increases, the curve reverses its slope and follows the law:  $T_1 \propto 1/C_{H_2O}$  ( $C_{H_2O}$  is the concentration of water). The reversal of slope takes place in the region of 30 to 40 percent of ethanol by weight.

Another relaxation effect is that associated with the spin-spin interaction. Spin-spin relaxation time (or transverse relaxation time) is the time needed for a system of spins whose phase has been established to return

to a state of random phase.

A new method has been devised to measure  $T_2$  and data were taken and the results compared with previous methods. Preliminary measurements using the method were used to find the  $T_2$  of ethanol and water mixtures.  $T_2$  is at least several times smaller than  $T_1$  for these mixtures. Since the present accepted theory of liquids predict  $T_1/T_2$  should be in the order of unity, this is an anomaly.

A seven inch diameter pole piece adjustable gap electromagnet and its associated power supply are described. The complete electronic instrumentation for the spin echo equipment used for the preceding measurements is described. These circuits include a unique method for producing the accurately spaced RF pulses necessary for spin echo experiments. A super-regenerative radio frequency head and the associated apparatus needed for resonance absorption experiments are described.

153 pages. \$2.05. Mic 56-2320

#### THE IDENTIFICATION OF CHARGED PARTICLES IN NUCLEAR EMULSIONS

(Publication No. 16,984)

John Samuel Urban, Ph.D.  
The University of Oklahoma, 1956

Co-chairmen: Professor Robert A. Howard  
Professor William Schriever

In any type of nuclear emulsion investigation, the identification of charged particles, which by means of interactions with the nuclei of the atoms of the emulsion itself have left tracks in the emulsion, is of fundamental importance. The actual identification consists of determining the mass and the charge. The evaluation of the kinetic energy at some specific point on the track is usually considered to be a part of the process. This dissertation consists of discussions of established methods and of an original method of particle identification.

The Leitz Ortholux Microscope, by means of which all quoted experimental data have been taken, is described as are the calibration procedures which were employed.

Ilford G5 emulsions, 400 microns thick, which had been exposed to cosmic radiation at an elevation of 100,000 feet, were used in these investigations.

Two fundamental equations utilized in nuclear emulsion analyses are the range-energy equation and the scattering equation. The observables are ionization density, residual range and the mean of the absolute values of the second differences due to scattering. It is, in general, necessary that two of these observables be employed for an identification to be made.

Established methods for ending tracks are ionization density as a function of residual range and scattering as a function of residual range. In these researches these established methods have been used, with special emphasis on the highly regarded technique of constant sagitta scattering. Experimental data are quoted for eleven particles which have been identified in this way.

Tracks known as non-ending tracks, where the particle has left the emulsion, decayed in its flight, or for

some other reason failed to come to rest in a process involving continuous space rate of energy loss, are more difficult to analyze. A method, original with the author, by which identification can be accomplished using scattering as a function of range, is described. This technique consists of evaluating, by successive approximations, the constants in a combination of the scattering equation with the range energy equation. The approximations are accomplished by an adaptation of the Method of Least Squares.

Five tracks made by known particles have been analyzed and shown to yield results consistent with those obtained by constant sagitta scattering. The method has also been applied to three unknown particles, and arguments given which purport to show that one has suffered an energy loss in a collision, and another has decayed in flight. The third particle, which left the emulsion, has been shown by an independent method to have a mass which is consistent with that determined by scattering measurements.

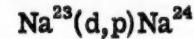
Expressions are quoted for the statistical deviations. The limitations of the method are discussed.

120 pages. \$1.50. Mic 56-2321

**ANGULAR DISTRIBUTIONS  
FROM DEUTERON-INDUCED REACTIONS IN SODIUM**  
(Publication No. 16,526)

William Ferdinand Vogelsang, Ph.D.  
University of Pittsburgh, 1956

Angular distributions were obtained for a group of reactions induced by 15 Mev deuteron bombardment of  $\text{Na}^{23}$ . The ground state and the 1.341 Mev state of the



reaction were fitted with Butler curves of  $\ell_n = 2$  and 0 respectively. The angular distributions of seven levels of the reaction  $\text{Na}^{23}(\text{d},\text{d}')\text{Na}^{23}$  were obtained. The Q values of these levels were also measured. The ground state and the first three excited states of  $\text{Na}^{22}$  were observed by the reaction  $\text{Na}^{23}(\text{d},\text{t})\text{Na}^{22}$ . It was possible to fit the angular distributions of all the  $\text{Na}^{22}$  states with  $\ell_n = 2$ . The Q value of the  $\text{Na}^{23}(\text{d},\text{t})\text{Na}^{22}$  ground state was measured to be  $Q = -6.211 \pm 0.040$  Mev. The absolute cross sections are given for all reactions observed.

60 pages. \$1.00. Mic 56-2322

**POLITICAL SCIENCE**

**POLITICAL SCIENCE, GENERAL**

**THE HANDLING OF WORKMEN'S COMPENSATION CLAIMS BY THE OHIO INDUSTRIAL COMMISSION**

(Publication No. 17,378)

William Elbert Biggs, Ph.D.  
The Ohio State University, 1956

The dissertation is an analytical and historical study of the handling of workmen's compensation claims in Ohio. The workmen's compensation laws of Ohio, like those in other states, are designed to give industrially disabled employees predetermined monetary and medical benefits without regard to negligence. The purpose of the study is to determine how fully the administration of the Ohio workmen's compensation law by the Ohio Industrial Commission has met the needs and relieved the hardships which led to the adoption of the workmen's compensation system, and whether the Industrial Commission has achieved the practical maximum of efficiency and equity in processing claims for benefits, as well as to consider whether substantial improvement could be made.

The dissertation is based largely upon an individual field survey, made in the summer of 1954, of the organization and procedures of the Industrial Commission and its staff for processing claims for workmen's compensation benefits. Unpublished reports from the staff of the Industrial Commission to the state legislature were supplemented by procedural information obtained by interviewing Commission employees performing the various steps involved in claim determination. Information was extracted from the staff's unpublished daily records of the time con-

sumed by most of the steps required for processing clearly compensable claims, and of the work-load of most employees involved in handling claims. Data from these records were analyzed for the period January through June, 1954.

As the study discloses, several of the goals sought in the passage of workmen's compensation legislation in Ohio have been achieved. The amount of benefit to the claimant and the cost to the employer can be determined in advance with considerable accuracy. A large number of claims are paid without the necessity of an investigation, hearing, or further litigation. Nevertheless, some of the goals sought have not been achieved. A complicated reporting form delayed the reporting of claims. More than a week was required by the Commission for the issuance of a check for a clearly compensable claim. More than a year was required for a decision in contested claims appealed to the Industrial Commission.

The study also revealed that the Industrial Commission had failed in substantial measure to attain the practical maximum level of efficiency and equity in processing workmen's compensation claims. The commissioners have failed to give adequate executive leadership to the agency, and there was no other locus of authority to achieve coordination, singleness of purpose, and morale. The various sections of the organization were semi-autonomous. The procedures for determining the merits of a claim were slow. Substantial time could have been saved in processing uncomplicated claims by changing the procedure. The rights of the employer to contest the merits of a claim and to assist in defending it were not fully protected by statute, although this shortcoming was partially relieved by the practices of the Commission.

Most of these difficulties and defects can be remedied by innovations and modifications with respect to statutory law and administrative organization and practices. Legislation in 1955 created a separate Bureau of Workmen's Compensation to administer the law which is headed by a single administrator with broad powers to reorganize and revise practices. This legislation gives ample opportunity for substantial improvement in efficiency and equity in processing claims, but there is, as yet, no certainty that such improvements will occur.

394 pages. \$5.05. Mic 56-2323

**THE FIRST CONSTITUENT ASSEMBLY  
OF PAKISTAN (1947-1954)**  
(Publication No. 17,047)

Golam Wahed Choudhury, Ph.D.  
Columbia University, 1956

This dissertation is an analytical account of the attempts made by the First Constituent Assembly of Pakistan (1947-54) to give the country a written constitution. The main theme of this study has been to examine why constitution making in Pakistan proved so difficult. This has been studied by analyzing the problems which confronted the Assembly.

The first and most difficult problem was the exact character that the state should take. The vast majority of the people of Pakistan are Muslims. Their aspiration to preserve and foster Islamic values was the main justification for insisting upon the partition of the sub-continent and the creation of Pakistan. While there was general agreement among the Muslim groups on the grounds of conviction and political expediency that the state should function in accordance with the principles of Islam, the different groups held divergent views about the nature and concept of an Islamic state. The conflict arose particularly between the ulema and the intellectuals on the definition of an Islamic constitution. The framers of the constitution were engaged in producing a synthesis of modern needs and Islamic principles. To what extent the First Constituent Assembly was successful in arriving at such a synthesis has been discussed in this dissertation.

Apart from this problem of the relationship between the State and Religion, there were a number of equally complex issues connected with the geographical division of the country into two parts, East and West Pakistan. A federal form of constitution was unanimously agreed upon in 1949 but serious conflicts developed regarding the details of the federal structure of the constitution between the two wings of the country which was, in the last resort a Bengali-Punjabi controversy. The main point of contention between the two wings of Pakistan was the quantum of representation for each in the future federal legislature. More than anything else it was this issue which for several years held up progress in drafting a new constitution.

There were two other points of dispute in the controversy of the two wings. The first related to the distribution of powers between the federal government and the provinces. East Pakistan demanded complete autonomy. The First Constituent Assembly was faced with steering a course midway between those who wanted maximum auton-

omy for the provinces with a weak centre and those who favoured a strong centre with limited provincial autonomy.

Lastly there was the language controversy between East and West Pakistan--whether Pakistan should adopt one national language, Urdu, or two, Urdu and Bengali.

Why did the First Constituent Assembly fail to write a constitution? Was it unsuccessful in solving the problems which confronted it, or was its failure due to attempts on the part of a group of politicians who deliberately wanted to delay the framing of the constitution? An attempt has been made to answer these questions.

The work has been divided into the following parts.

(1) Beginnings and Background wherein the transfer of power, the creation of the First Constituent Assembly and the Interim Constitution have been discussed.

(2) Part II which deals with the problem of the relationship between the State and Religion; here the origin of the demand for an Islamic state, its concepts and definitions by different groups and the problem of Religious Minorities have been analyzed.

(3) Part III attempts to discuss the main issues and points of dispute in the controversy between the two wings of the country.

(4) Part IV gives the main features of the draft constitution as finally adopted by the First Constituent Assembly and an estimate of its work.

241 pages. \$3.15. Mic 56-2324

**A COMPARISON AND EVALUATION OF  
THE ORGANIZATION AND TECHNIQUES  
OF THE MAJOR POLITICAL PARTIES IN  
NEW YORK CITY AND THE REACTION  
OF THE ELECTORATE TO THE  
ORGANIZATIONS (1929-1949)**

(Publication No. 10,624)  
Lorraine Colville, Ph.D.  
New York University, 1954

Chairman: Professor Durward Pruden

Cognizant of the need in a democratic society for data on political activities, the writer has delved into the seldom treated machinations of the New York City political organizations and the accompanying reaction of the metropolitan voters.

The mechanics and operators of the New York political parties may be compared to the organization and directors of a great corporation with the citizens of the City as shareholders in this municipal corporation. Consequently, the actions of the directors have a direct effect on the millions of shareholders.

Through the use of interviews and the examination of political party records, newspaper files and election returns ranging from election district to the City-wide vote a clear picture has been developed of the New York political parties including their structure, leaders, activities and techniques from 1929 to 1949.

The study disclosed a marked similarity in the political machines ranging from fractional disputes over leadership and party control to the selection of candidates and issues for the public's approval. Against a background of

New York City political history the picture of the bosses, district organizations and their functions and devices for gaining and maintaining political control of the City became clear and sharp. That no party can claim a monopoly on virtue and democratic procedures or an immunity from petty leadership and political expediency became an established fact.

Beyond the organized and detailed analysis of political data on the New York City machines, hitherto lacking, the thesis indicated significant trends in the voters' reactions to the maneuvering of the parties. From the over-all study and evaluation of facts, with special emphasis on those activities and techniques directly related to the municipal campaigns, it was possible to ferret out a pattern of the electorate's response to candidates and issues during the period under scrutiny.

The study clearly pointed to the need for an improvement in the organization and directorship of the New York City corporation. If the democratic processes are to be preserved and strengthened it is incumbent upon the educator in the social sciences to do the following:

1. Assist in the training of capable directors for the great municipal corporation.

2. Enlighten the citizen shareholders as to their responsibilities and privileges which pertain to the organization and board of directors of the corporation. In the last analysis, the control of the corporation resides in the hands of the shareholders - the citizen body.

400 pages. \$5.00. Mic 56-2325

#### ATOMIC CITIES: THE ATOMIC ENERGY ACT AND THE STATES

(Publication No. 17,430)

William Clinton Ellet, Jr., Ph.D.  
University of Michigan, 1956

The atomic cities of Oak Ridge, Richland, and Los Alamos are owned and operated by the Atomic Energy Commission under the authority of the Atomic Energy Act. The Act sanctions the existence of these communities in order that the Commission may provide for the housing, welfare, health, and safety of its workers at the atomic project sites in New Mexico, Tennessee and Washington. These towns, however, run counter to the traditional American concepts of local government since there is no local autonomy and the municipal facilities and services are administered by a federal agency.

This thesis investigates the constitutional justification of the federal government's assumption of the responsibilities of local government, the jurisdictional difficulties such an assumption poses, the pattern of cooperation that exists in the cities between the two governments, national and state, and the manner in which such communities are transferred to self-governing municipalities under state law.

The national government serves as the local government of a federal town either by acquiring exclusive jurisdiction over the townsite from the state or as an incident of its ownership of the community. Under exclusive federal jurisdiction (Art. I, sec. 8, cl. 17), the state's civil and criminal jurisdiction is ousted and the state's residual

powers of government over the area pass to the national government. By Congressional retrocession, the state does retain the right to serve civil and criminal processes and tax private persons and corporations residing on the federal territory. Moreover, the courts have ruled that the state, in granting jurisdiction to the national government, may reserve subjects to its residual jurisdiction so long as such reservations do not interfere with the federal purpose. The major deficiency in this type of jurisdiction is that the inhabitants may be denied many of their civil and political rights because they are not regarded as residents of the state where the community is located.

However, when the national government serves as the local government as an incident of its ownership, none of the above deficiencies develop. The national government, by virtue of its constitutional authority to regulate and dispose of federal property (Art. IV, sec. 3, cl. 2 of the Constitution) and its common-law powers as the landlord, may adopt measures analogous to the state's police powers in order to protect its property and to determine its use. Nevertheless, the state retains its residual right to administer and control the ordinary civil and criminal law and to regulate and tax the property and activities of private persons and corporations residing on the federal property. This state authority does not extend to the point where it may interfere with the purpose for which the property was acquired or its administration. In light of this concurrent state jurisdiction, state cooperation is required in law enforcement, the administration of justice, and in the essential services of government.

This pattern of cooperation and collaboration in law and the administration of the essential services of local government must also be carried over in the transition of federal communities to municipal incorporations under state jurisdiction. Thus, government towns necessarily depend upon both the national and state governments for law and order and the preservation of the communities' safety, health and welfare.

202 pages. \$2.65. Mic 56-2326

#### CONGRESSIONAL STAFFING, WITH EMPHASIS ON THE PROFESSIONAL STAFF

(Publication No. 17,063)

Kenneth Theodore Kofmehl, Ph.D.  
Columbia University, 1956

In the Legislative Reorganization Act of 1946, an ambitious attempt was made to improve the staffing of Congress by expanding the existing and introducing new elements of a professional staff. This dissertation is an analytical, descriptive study of the nature and functioning of that staff during the five and one-half year period from the start of the 80th Congress on January 3, 1947, when the Legislative Reorganization Act was first put into effect, through the adjournment of the 82d Congress on July 7, 1952. Because very significant developments concerning one type of legislative oversight--the ratification of specific administrative acts by congressional committees--occurred in the 83d Congress, the sections dealing with it are based on data extending through September 30, 1954.

Although documentary sources were also used, the heart of the research effort for this study was the collec-

tion of firsthand information from congressional staff members. Approximately 180 congressional employees were questioned in controlled interviews averaging over an hour in length. An attempt was made to select a representative sample of persons to interview from each part of the congressional staff investigated.

This study endeavors to strike a balance between an extensive and intensive treatment of the subject by concentrating on the three primary components of the congressional staff under the immediate control of Congress: the committee staffs, office staffs, and Office of the Legislative Counsel. They are the most closely interknit elements of the congressional staff, perform the bulk of the staff work on legislation and in connection with oversight of administration, and comprise the largest share of the professional staff. Their organization, recruitment, qualifications, tenure, size, and work are described and evaluated. And their relationships with one another and with the other congressional, the executive branch, and nongovernmental staffs are discussed. A summation of the conclusions reached rounds out the study.

For the most part, the principles incorporated in the Legislative Reorganization Act and the other organic legislation of the three primary segments of the congressional staff covered are valid. Though some minor amendments would increase the consistency and effect other marginal improvements in the staffing provisions of the Legislative Reorganization Act, there is no pressing need for them. Rather, the major legislative task is to frustrate the growing attempts to supersede those principles in the law--especially of smallness and of nonpartisanship in committee staffs. Having built a solid statutory foundation for a staff, Congress now has mainly to protect that from erosion and to avoid erecting too large an edifice on it.

Under the extant staffing provisions, Congress has in general supplied itself with the kind of professional staff required to facilitate its functioning in relation to the other components of our governmental system. It should not build up a staff to duplicate theirs or to usurp their rightful duties. Toward the close of the period covered, Congress manifested inclinations in both these directions. Ominous tendencies toward overstaffing and using staff as an instrument to encroach on the executive branch province were developing. Only Congress can remedy this situation. The President could help somewhat by a more astute and determined defense of executive prerogatives than was made during the period covered. But fundamentally, the only corrective is congressional self-restraint based upon an awareness of the individual legislator of the danger to his vital office as well as to the constitutional balance of our governmental system from an excess or improper use of congressional staffing. Having registered a very substantial advance on the staffing front, Congress should consolidate its gains and resist the temptation to go too far.

387 pages. \$4.95. Mic 56-2327

## INTRODUCTION TO A SOCIO-POLITICAL STUDY OF THE EURASIANS OF INDONESIA

(Publication No. 15,436)

Paul Willem Johan van der Veur, Ph.D.  
Cornell University, 1955

Chairman: Herbert W. Briggs

This study deals with the Eurasians, the population group of Dutch-Indonesian descent which maintained itself as a distinguishable group in Indonesian society. Until the end of the 19th century it was possible to define loosely the group as Christians of mixed European and Indonesian descent who were considered part of the European group. The Dutch nationality law of 1892 made a somewhat sharper definition possible. It specified that anyone was a Dutch citizen by right of birth who was the legal, legalized or paternally recognized child of a father who possessed Dutch status at the time of the child's birth. For the purposes of this study those persons of mixed Dutch-Indonesian descent possessing Dutch nationality are the Eurasians of Indonesia.

The techniques employed in the study included canvassing scholarly research in this field; the analysis of Dutch and modern Indonesian literature dealing with the group, the several party journals of Eurasian organizations, the records of the People's Council and the attitudes expressed in the Indonesian press. In addition, the writer and his wife carried out a participant-observer study in a Eurasian relocation center in the Netherlands.

In writing the study the historical approach was utilized. Initially, the Eurasian group has been traced through its early beginning in the 16th and 17th centuries to the end of the 19th. An analysis of the group is subsequently made with regard to religion, language, cultural expressions and other group-identifying factors. After taking account of the changes which occurred in colonial society after about 1870, attention is focussed on the development of a socio-political consciousness in the 20th century. The political sentiments of the group are traced along three broad ideologies up to Indonesian independence in 1949. The first, originally represented by Douwes Dekker and his Indische Partij, believed that the future of the Eurasians lay with an independent Indonesia in which the Eurasians together with the Indonesian intelligentsia would lead the masses. A second view, held by the powerful Indo-Europeesch Verbond, believed that the Indies should eventually be given more internal independence but should maintain close ties with the mother country, the Netherlands, in other fields. The followers of this viewpoint - and they were the most numerous - had little sympathy or patience with the desires of Indonesian nationalists. The small third movement believed both approaches to be unrealistic and hoped to escape the dilemma, which they felt the Eurasians were soon to face, by settling in an area all their own - Dutch New Guinea.

Although the position of the Eurasians was becoming progressively more untenable politically and economically in the years immediately preceding the Pacific War, their position was sheltered by the colonial regime. The war, the subsequent "Indonesian conflict", and the granting of Indonesian independence in 1949 were successive turning points in Eurasian history. This writer, on the basis of historical factors, considered it highly unlikely that Eurasians would opt for Indonesian citizenship in large numbers

during the two-year option period from December 27, 1949 to December 27, 1951. This was substantiated by the actual developments. A further analysis of the present position of the Eurasians depends upon sociological research in Indonesia, the Netherlands and New Guinea. The writer considered the end of the option period, therefore, an appropriate point at which to conclude this particular study of the Eurasian group.

The general conclusion reached in this study is that the Eurasians are another example of a marginal group. Forever molded by colonial policy, it dictated the very life and fortunes of the group. The forceful end of colonial society cast the community loose from its moorings and set it adrift in various directions.

603 pages. \$7.54. Mic 56-2328

#### POLITICAL SCIENCE, INTERNATIONAL LAW AND RELATIONS

##### THE ILO 1935-1955: CHANGES IN ITS STRUCTURE, FUNCTION AND POLICY

(Publication No. 16,994)

Anne Boise Beeler, Ph.D.  
Cornell University, 1956

Among international unions, the International Labor Organization has established since 1919 a unique record for survival and growth through the continuous adjustment of its policy and functions to the demands of a changing world. The ILO started as a small organization centered in Geneva, concerned primarily with the adoption of international Conventions and Recommendations and supported in these efforts by a modest secretariat. Blessed with a comprehensive and flexible Constitution, the ILO was able to face the depression of the 1930's with positive efforts to alleviate the social and economic ills of that period, to survive the political crises and the armaments race of the late 1930's and even to continue functioning as a technical and policy-making institution through the Second World War.

Its growth in the ten years since the War has been particularly striking. Within that period the Organization has revised its original Constitution and redefined its basic principles and goals and has proceeded to attack the outstanding post-war problems of reconstruction, the effective use of manpower and technical assistance to underdeveloped areas. To follow this course, the ILO has had to accept close integration into the United Nations system and to develop co-operative relationships with a number of regional and other Organizations not included in that system. Operating within a limited budget, the Organization has had to expand greatly its technical and research activities and to enter the realm of direct operational action on a regional basis. At the same time the ILO has continued to be an Organization active in formulating international labor standards and social policy and to develop new machinery in an effort to safeguard trade union rights. With the post-war efforts have come increased complexity in the ILO structure and the development of a variety of procedural and other techniques designed to promote social justice.

Dr. Francis G. Wilson's Labor in the League System is a comprehensive account of the first fifteen years of the Organization's history, and certainly little new remains to be said about the general characteristics of the ILO up to 1934. Since that time, however, twenty more years have been added to the ILO experience. Some of the outstanding social problems of these years have been discussed in articles dealing with the ILO and a few of these have indicated the connection between certain developments within the Organization and the impact of world events. No one, however, has attempted to give a cohesive account of developments in the ILO structure, functions and policy between 1934 and 1955 either in themselves or in relations to the world situation of these years.

This thesis has attempted, without going into the exhaustive detail supplied by Dr. Wilson, to point out the most outstanding of these developments and their relationship to the political, social and economic background of the period. Successive Chapters deal with the revision of the Constitution, the development of procedures relating to the formulation of international labor standards and social policy, the application of Conventions and Recommendations and the ILO activities as a technical and research institution. The final Chapter discusses the place of the ILO in a system of international organizations including its relationship with the United Nations through 1955.

229 pages. \$3.00. Mic 56-2329

#### INDIA'S RELATIONS WITH THE UNITED STATES, 1947-1955 (PARTS I AND II)

(Publication No. 16,787)

Bishwanath Prasad Sinha, Ph.D.  
University of Missouri, 1956

Supervisor: Chesney Hill

Indian-American relations before World War I were very limited and very few. During the interwar period awareness of each other's affairs grew a little more. But not until after Pearl Harbor did India become a direct concern for America. During World War II, thousands of American soldiers came into direct contact with Indians, Indian-American trade increased, and India and America opened legations for the first time. President Roosevelt brought pressure upon the British to grant India independence. When the war ended American stock stood very high.

The main reason for Indian-American conflicts in the post-war era has been the adoption by India of a policy independent of the two power blocs. When the Iron Curtain was lowered across a half dozen Eastern European states, America adopted the policy of containing further Soviet expansion. Cautious in her steps, jealous of her newly-won independence, and suspicious of great powers, India adopted a policy of "no entangling alliances."

Promotion of peace has been the main objective of both American and Indian policies, but they have differed in their means and emphasis. India has viewed poverty, racism, and colonialism as the greatest dangers to peace.

The United States has held that the greatest danger to peace is the ambition of the super Communist powers to dominate the world. To a certain degree each has seen the other's point of view. Nevertheless what is of primary importance to one is of secondary importance to the other.

The Indo-Pakistani quarrel over Kashmir has proved to be an obstacle in the way of Indian-American cooperation. India had suffered initial defeats in the Security Council at the hands of the United States. Ever since she has been suspicious of the American policy toward Kashmir. Military assistance to Pakistan has added fuel to the fire of Indian-mistrust in the American impartiality regarding Kashmir.

On the Korean question, Indian policy was in accord with the American policy before and long after the aggression. Crucial differences arose on crossing the thirty-eighth parallel and on branding China aggressor. India opposed both. Later an Indian resolution became the basis of the armistice agreement and India played an important part in Korea.

India, regarding Communist China as the *de jure* and *de facto* government, has advocated its recognition and representation in the United Nations; whereas America has opposed it. Another matter of conflict has been military alliance in Asia. America has encouraged regional military alliances; India has opposed it. Most of the diplomatic differences are not due to misunderstanding but are genuine and honest and have flowed from seeing things differently.

Indian-American trade has increased and would have increased even more, if India could have obtained more dollars from America. The main reasons for small American investment have been India's socialistic outlook, American unfamiliarity with the Indian scene, and Indian-American diplomatic conflicts. India has received on the average a little more than \$50 million annually since the fiscal year, 1951-52, as aid from America. She will need more, if she is to compete successfully in the fateful race with China. The cultural sphere presents no difficulty in Indo-American cooperation and in this field much can be done to improve relations in other fields by more exchange of persons and cultural materials.

387 pages. \$4.84. Mic 56-2330

#### PIERRE-JOSEPH PROUDHON'S THEORIES OF INTERNATIONAL ORGANIZATION

(Publication No. 16,947)

Sadie Goodman Walton, Ph.D.  
University of Colorado, 1955

Supervisor: Professor Henry W. Ehrmann

Modern nationalism as a dynamic political force dates from the French Revolution. In identifying the nation with the state by transferring sovereignty from the monarch to the people, the Revolution gave great impetus to movements for national liberation, and the political unification of a nationality was presumed to be a condition for the achievement of individual liberty. When this revolutionary principle of nationality was repudiated by the Treaties of Vienna in 1815, liberals and radicals condemned them as

instruments of reaction and devoted themselves to plans for revising the map of Europe along nationalist lines. They had an influential champion in Napoleon III who desired to put an end to the *Diktat* of Vienna. In 1859 he took a decisive step in this direction by supporting Piedmont against Austria.

This was when Pierre-Joseph Proudhon raised his voice "to express the opinion of the Republic...and the thought of the Revolution...on the question of nationalities." In this dissertation, we have tried to discover what motivated Proudhon's dissent from the view that individual liberty depended upon the establishment of the centralized uni-national state. In studying Proudhon's correspondence and his topical and doctrinal works composed between the outbreak of the Austro-Sardinian War (1859) and his death in 1865, we have found that Proudhon objected to the principle of nationality for three reasons. As a patriot he feared that a rearrangement of the European state system which would establish the rival Kingdom of Italy on the borders of France would tend to diminish French influence on the Continent. As a European he feared that the resurgent nationalist movements of his time would disrupt the peace of the international community. His chief objection, however, resulted from his distrust of political centralization. Even after having modified his position that the state as an institution must be abolished, Proudhon never relaxed his opposition to the centralized uni-national state of which France was the model *par excellence*. Such a state he considered a Rousseau-ist and Jacobin perversion of the doctrine of the social contract, and he found it contrary to the idea of the Revolution as he conceived it. Rather than emancipating the individual, the centralized state became a class instrument benefiting the bourgeoisie or the aristocracy instead of the people as a whole.

Because of his distrust of the state and of his concern for the position of France and the stability of the international community, Proudhon was anxious to find a solution to the contemporary problem of nationalities that was compatible with the existing system of international organization and with his economic theories of mutualism. Towards the end of his life, he concluded that only the transformation of centralized states into federations whose essence was "always to reserve more to the citizens than to the state, to the municipal and provincial authorities more than to the central authority..." answered the political and social questions of his time.

The significance of Proudhon's proposals for the organization of Europe is twofold. In the field of intellectual history, they are an interesting commentary of a professional dissenter who insisted that he, rather than those conventionally classified as revolutionaries, was the true apostle of 1789. In the field of political and international organization, they are important in suggesting that nationalists of the mid-nineteenth century were not necessarily bound to pursue their aims through the formation of centralized, uni-national states, but had in federalism a means for satisfying a multiplicity of individual and group interests within the state and for maintaining peaceful relations between states.

388 pages. \$4.95. Mic 56-2331

**POLITICAL SCIENCE, PUBLIC  
ADMINISTRATION**

**POLITICAL AND TECHNICAL ASPECTS  
OF THE UTILIZATION OF GROUND WATER  
IN THE STATE OF UTAH**

(Publication No. 16,886)

McCown Edward Hunt, Ph.D.  
University of Utah, 1956

Chairman: Dr. Ellsworth E. Weaver

The increasing demand for water for all purposes and the consequent increased per capita consumption that has accompanied a growing population has created an ever present emergency in Utah. This emergency is the need to keep not only abreast of water needs, but to remain slightly in the van.

Water problems, since they affect every human, every animal, and every plant, are not only major in an arid region such as Utah, but also of primary concern to all echelons of government. The problem of water procurement and supply cannot be isolated into any particular field of endeavor but must receive the attention of legislative, legal, administrative, and technical groups.

With the exception of imported water, which is brought from some region where it is not used to an area of consumption, any area of land that might be selected is dependent upon precipitation over the area for its source of water supplies. The science of hydrology is concerned with water throughout its cycle from the time it falls as some type of moisture until it returns to the air as water vapor.

When precipitation falls, any one of numerous things may happen to it. It may evaporate while falling; it may evaporate after falling on trees or bushes; it may evaporate after reaching the ground; it may run off the ground forming rivulets, streams, rivers, and finally lakes or the ocean; it may penetrate the ground a short distance and be used by plants; or, if in sufficient quantity, a certain amount may penetrate to the zone of complete saturation and become ground water.

Ground water, in its natural state, moves generally slowly to areas of natural discharge where it becomes springs, swamps, or effluent streams. Some also flows directly into lakes or the ocean. After again reaching the surface, it follows the usual cycle through evaporation and back again to water vapor in the air.

The pervious strata in the earth, usually sands and gravels, act as natural reservoirs for the ground water. If the area of entry into the ground water reservoir is sufficiently high, generally on the foothills, and the pervious beds are confined by clay or other impervious materials, wells drilled into the reservoir will tap water under pressure or be artesian wells.

Nearly all, if not all, of the surface water in Utah is appropriated and subject to no further appropriations for use. The expanding population and economy, however, demand constantly more water. This need can be met from local sources only by the reprocessing of waste water or by the maximum utilization of ground water. The near future will demand both actions. For the present it is probable that proper ground water development and use will meet the majority of needs in all except a few areas in Utah.

Obtaining the maximum use from ground water supplies presents legal and administrative problems as well as technical ones. Water law is complicated, ground water law more complicated. Like so much of the field of law, it has grown to meet situations and in this case the growth was from different backgrounds. Four different principles of law have been applied to ground water disputes.

The first legal principle applied to ground or percolating waters in this country was the English rule of absolute ownership or riparian rights. This allowed a landowner to extract all the water he wished from beneath his land regardless of the effect upon the supply beneath his neighbor's land.

Another principle was called the American rule of reasonable use. Although this allowed the landowner to withdraw water from his land, it required the amount withdrawn to bear some reasonable relationship to the use of the overlying land. Exporting of large quantities of water for use or sale at distant points was contrary to this principle.

A third principle, relating to the principle above, was known as the doctrine of correlative rights. As developed in California, this rule accorded to all owners of land overlying a common ground water supply coequal rights to make reasonable use of water on or in connection with their overlying lands. A notable feature was the power of the court to make an apportionment of the supply in the event of overall shortage. Likewise any surplus above the reasonable needs of the overlying lands might be appropriated for distant use, or for public utility use within the ground water area.

The final principle, which is the only one not based upon ownership of the overlying land was the doctrine of prior appropriation for beneficial use. This doctrine, especially with respect to ground water, was not given much legal recognition until the late 1920's. Rights of land owners were considered pre-eminent. However, in recent years, the trend toward considering ground water rights on the basis of priority of appropriation and also on the basis of beneficial use has been increasingly evident. Legislation and legal decisions in Utah follow this doctrine as a general rule.

The development of culture in Utah, and culture is spoken of in this sense as any of the works of man, has generally tended to follow the location of water supplies. By referring to maps showing the location of towns, industries, and farms, it is easy to see where settlements have clustered at the bases of the mountain ranges that insured constant runoff and water supplies throughout the year. Recently, development has tended to take place where supplies of ground water have been shown to be adequate.

Certain major areas in Utah, in which ground water is a key factor in development, have been closely studied to determine the possibility of further development through the increased use of ground water. These areas are Cedar City Valley, Parowan Valley, Pavant Valley, Sevier Desert, Utah Valley, the Monticello and Blanding-Montezuma areas, the Bountiful District of the East Shore Area of Great Salt Lake, the Beryl-Enterprise District and the Milford District of the Escalante Valley, Tooele Valley, Ogden Valley, and the Jordan or Salt Lake Valley.

To summarize the recommendations for each area:

Cedar City Valley is apparently at the limit of exploitation or is exceeding its recharge supply. No further development is recommended until a few more years obser-

vation of well levels have determined whether the present rate of water withdrawal may be continued or whether curtailment of pumpage must take place.

Parowan Valley is almost at equilibrium with respect to utilization of ground water. It is possible that some small additional development could take place without harm to the ground water reservoir.

Pavant Valley has only recently been reopened to new development. The effect of this increased demand upon the ground water supply is being carefully observed, and if demand very apparently exceeds recharge, the area will again be closed to new appropriation by the State Engineer.

The Sevier Desert area will apparently support a withdrawal of 1200 to 1500 acre-feet a year from its fine sediments. Only observation over a long period of time could determine whether mining of water occurs under additional drawdown.

Utah Valley is able to develop extensive new supplies of ground water. No sign of depletion has yet appeared under the existing large demand.

The Monticello and Blanding-Montezuma areas, which derive their water from deep rock sources, should apparently develop to the economic limit of pumping from their water sources.

The Bountiful District should only make additional development from deep aquifers until the Weber project is sufficiently advanced to allow a complete analysis of the water supply of the area.

The Escalante Valley is actually having its water mined in certain critical areas. Unless artificial recharge during flood periods is successful, it will be necessary to limit present developments to reduce supplies of water in the not far distant future.

Tooele Valley has potentialities of still greater ground water development than at present. So far observation does not indicate that the limit of development of the basin has been reached.

Ogden Valley has certainly not reached the limits of re-

charge of its basin. Further ground water development to utilize the large spring runoff is recommended.

Due to the great amount of water used in Salt Lake Valley, a special geological study was made of the Little Cottonwood-Bells Canyon region to determine if a major source of ground water existed in the glacial and lake sediments at the mouths of these canyons. Although the interstices in the aquifer had been made very uniform and small in size by the action of the glacial streams on the lake, stream, and glacial deposits, the evidence appears to clearly indicate that a large aquifer capable of supplying 30 to 40 cubic feet per second exists. It is recommended that this aquifer be tapped to the limit of capacity by a series of relatively small bore wells if pumping conditions permit, 10 to 12 inches in diameter, drilled several a year up to the limit of supply indicated. This would supply a good backlog of water for the city whenever required.

Administration of ground water in the state appears to be complicated by too many authoritative agencies. It is recommended that legislative thought be given to consolidation and careful delineation of powers. It is believed that administration would be improved by the inclusion of the Water and Power Board and the Water Pollution Control Board into a single agency of fourteen members serving staggered six year terms. All policy making would be done by the board. The State Engineer would be executive officer of the board with a vote thereon in all matters concerning interstate waters. The present director of the Utah Water and Power Board would be executive officer of the new board with a vote thereon in all matters concerning interstate waters. The Sanitary Engineer of the State Board of Health, acting therefor, would be executive officer of the board, with a vote, in all matters concerning water pollution.

Legislation to implement the foregoing, and to strengthen the police power of the new board with respect to control of all water in the State for the greatest common good, is recommended.

260 pages. \$3.35. Mic 56-2332

## PSYCHOLOGY

### PSYCHOLOGY, GENERAL

#### THE EFFECT OF A REFLECTIVE AND OF A LEADING PSYCHOTHERAPY ON CERTAIN CLIENT CHARACTERISTICS

(Publication No. 16,699)

Jefferson D. Ashby, Ph.D.  
The Pennsylvania State University, 1956

#### Introduction

The general aim of the study was to assess the effects of two variations in psychotherapeutic treatment, i.e., a reflective and a leading type of psychotherapy, on the behavior of clients. The study analyzed several client pre-therapy characteristics as they related to client reactions to therapy in its early stages. It also compared the two treatments in terms of changes in several client characteristics from pre- to post-therapy.

The study was part of a coordinated research project and was based on a double classification design. The two independent variables were: 1) differences in type of treatment imposed, and 2) differences between the therapists. Clients, primarily university students, were randomly assigned to both treatment and therapist. Ten therapists had two clients in each treatment condition.

#### Results

Correlations between pre-therapy measures of autonomy, succorance, deference, dominance, aggression, and cognitive ambiguity and two measures of client reaction to therapy, i.e., a behavioral measure of defensiveness and a client questionnaire concerning the therapeutic relationship, were computed. The correlations obtained for one treatment group were compared with the correlations obtained for the other treatment group. Comparisons were made by means of a test of significance of the difference between r's using Fisher's  $z$ .

Summarizing the results of the correlational analysis, it appeared that the client pre-therapy characteristics, as studied here, did not generally relate differentially to client's early reactions to therapy when comparisons were made between a leading and a reflective treatment. Only four such differences were shown; however, three of these differences indicated that the pre-therapy measure correlated significantly with the reaction shown by clients to a leading treatment. The measures did not correlate significantly with client reactions to a reflective treatment. This suggested that differences in pre-therapy characteristics were more important if treatment was of the leading type.

The analyses of changes in clients undergoing a reflective and a leading therapy utilized both Analysis of Variance of Differences and Analysis of Variance. The analyses indicated that there were no differences between the

treatments in the way they effected change in maladjustment, anxiety, dependency, defensiveness, attitude toward self, or attitude toward others. None of the  $F$  ratios were significant between treatments, among therapists, or in the interaction of therapists with treatment. This suggested that at least for the two forms of brief psychotherapy, as studied here, differences in treatment did not produce differences in outcome. It should be pointed out, however, that these findings do not preclude the existence of real differences between such treatment methods. Since the treatment period was relatively short, it may be that differences did not have a sufficiently long period of time to occur. Perhaps if treatments were extended for longer periods, differences would be found. Also, the measures used may not have measured differences which existed.

It is interesting to note that the therapists consistently rated clients as more improved in the leading treatment. Since most of the therapists expressed a preference for the leading treatment, this suggested that the factor which accounted for the difference was the bias of the group of therapists. None of the other analyses in the study indicated that one treatment produced changes significantly different from changes produced by the other treatment. These data would tend to support the interpretation that therapists rated improvement more in terms of bias than in terms of actual changes which occurred.

#### VITA

Jefferson D. Ashby was born in Blytheville, Arkansas. He graduated from high school in 1944 at West Frankfort, Illinois. After two years military service, he entered Southern Illinois University, where he completed his B.S. in 1949, and M.S. in 1950. In 1950, he enrolled at The Pennsylvania State University. He served as Assistant to the Dean of Men at Southern Illinois University during the summer of 1951. He joined the staff of the Division of Intermediate Registration in 1952, and became Assistant Director of the Division in September, 1954. He is a member of the American Psychological Association, the Pennsylvania Psychological Association, Psi Chi, Kappa Phi Kappa, Alpha Kappa Delta, and Phi Delta Kappa.

170 pages. \$2.13. Mic 56-2333

**THE EFFECTS OF EXPECTATION ON ATTRACTIVENESS OF GOAL OBJECTS AND ON THE FEELINGS OF SUBJECTS UPON ATTAINMENT OR NON-ATTAINMENT OF A GOAL OBJECT**

(Publication No. 17,218)

Arnold H. Chin, Ph.D.  
University of Pennsylvania, 1956

Supervisor: Dr. Francis W. Irwin

This study was designed to test the effects of expectation in a situation where an individual attains or does not attain a goal object after having previous expectations of attainment or non-attainment. The hypothesis advanced in this study was that the effects of expectation would not be manifested in the attractiveness of the goal object but would be manifested in the feelings of the subjects upon attaining or not attaining the goal object. Eighty school children, ranging in age from six to nine, were asked to rank nine toys as to their relative attractiveness. In each case, the toy ranked fifth was used as the goal object and the subjects were told that they could attain the object by playing a game. To vary expectation, half of the subjects were told the game was a very easy one and half were told the game was a very difficult one. The conditions of attainment and non-attainment were likewise varied experimentally. Following the game, half of the subjects were asked to rerank the toys and then to rate their feelings upon attainment or non-attainment on a seven-point scale. The other half was asked to rate their feelings and rerank the toys.

The major conclusions are summarized below.

1. Expectations established prior to attainment or non-attainment had no effect on the attractiveness of the goal object after attainment or non-attainment.

2. Expectations established prior to attainment or non-attainment had a significant effect on the feelings of the subjects upon attainment or non-attainment. Under similar conditions of non-attainment, subjects who had previously expected to attain the goal object expressed greater unhappiness than subjects who had expected not to attain the goal object.

3. Under similar conditions of attainment, subjects who had previously expected not to attain the goal object showed no difference in their expressed feelings from subjects who had expected to attain the goal object.

4. Under similar conditions of Expect Attainment-Non-attainment, subjects who rated their feelings after reranking the goal object expressed greater unhappiness than subjects who rated their feelings before reranking the goal object.

34 pages. \$1.50. Mic 56-2334

**SOME FACTORS IN ANTI-NEGRO PREJUDICE AMONG PUERTO RICAN BOYS IN NEW YORK CITY**

(Publication No. 16,588)

Leon Drusine, Ph.D.  
New York University, 1955

Chairman: Professor Mary Beauchamp

The purpose of this study was to determine the relationship between anti-Negro prejudice and selected variables among a group of Puerto Rican boys in New York City. The basic variables considered were authoritarianism, intolerance of ambiguity, and feelings of alienation from the family. The following additional variables were also considered: (a) years of residence by the subjects on the American mainland, (b) the skin color of the subjects, (c) prejudice against other minority groups.

The sample consisted of 129 boys, twelve to sixteen years of age, of low socio-economic status, who were either born in Puerto Rico or had at least one parent born there. All subjects were able to read English at the fourth grade level or better.

The instruments used were the Horowitz Faces Test as the measure of anti-Negro prejudice; the Traits Attribution Scale as a measure of verbally expressed attitudes toward selected ethnic groups; the Meer-Payne Children's F-scale as the measure of authoritarianism; and the Elias Family Adjustment Test as the measure of feelings of alienation from the family. The measure of intolerance of ambiguity was the total number of extreme answers on the last two scales mentioned.

The results were as follows: The most prejudiced group (the upper quarter of scorers on the Faces test) seemed significantly more authoritarian, on the average, than the least prejudiced group (the lower quarter). The most prejudiced also seemed significantly more intolerant of ambiguity than the least prejudiced.

There appeared to be no significant difference between the most and least prejudiced groups in degree of alienation from the family; nor was any relationship found between prejudice against Negroes and the skin color of the subjects or their length of residence on the American mainland. Verbally expressed attitudes toward Negroes were significantly related to verbal attitudes toward Jews and Italians, with r's of .47 and .29, respectively.

The incidental findings of this study may be summarized as follows: (1) The subjects appear to be prejudiced against Negroes, on the average. (2) The ethnic groups selected are held by the subjects in the following order of esteem: Americans, Puerto Ricans, Jews, Negroes, Italians. The differences between the mean ratings of Puerto Ricans and Negroes, and between Americans and Puerto Ricans, were both significant at better than the .001 level of confidence. (3) The latter difference suggests a relative devaluation of the self-group as compared to the reference group, the Americans. (4) The population as a whole seems high in authoritarianism. (5) On the average, the subjects seem to suffer from marked feelings of alienation from the family. (6) The picture test of prejudice, the Faces Test, seemed to reach deeper-lying prejudicial attitudes; the verbal tests more superficial ones. (7) The overt expression of prejudice seems inhibited in the group, possibly as a result of educational programs for better group relations in which they have participated.

169 pages. \$2.11. Mic 56-2335

**THE NON-COMFORMITY OF HIGH STATUS INDIVIDUALS: AN EXPERIMENTAL INVESTIGATION**

(Publication No. 17,226)

Norma D. Feshbach, Ph.D.  
University of Pennsylvania, 1956

Supervisor: Dr. James C. Diggory

The present investigation was designed to study the relationship between group status and conformity to a group consensus when conformity was detrimental to the interests of the group. It was hypothesized that under these conditions high status individuals, by virtue of their more secure position in the group, would manifest significantly greater non-conformity than low status individuals who are more subject to fear of rejection by the group. Similarly, it was predicted that experimentally induced high acceptance would result in greater non-conformity than experimentally induced low acceptance. It was further predicted that anticipation that one's judgments would remain private would produce significantly more non-conformity than anticipation of public knowledge of one's judgments.

In order to form relatively cohesive groups, the experimental subjects were selected from strong campus fraternities. High and low status subjects from each fraternity were randomly assigned to induced high and low acceptance and to public-private conditions. Sub-groups representing each fraternity were required to make a series of 10 judgments as to which of two surfaces contained a greater number of dots, the discrepancy between the surfaces becoming increasingly clearer with each presentation of the stimuli. A conflict was established between the properties of the stimuli being judged and a fictitious group norm.

The following results were obtained:

1. High status subjects manifested significantly greater non-conformity than low status subjects with the exception of one condition; namely, when their initial choice is incorrect and they anticipate public knowledge of their judgments.
2. High acceptance subjects tended to manifest less non-conformity than low acceptance subjects, this difference failing to be statistically significant.
3. While no overall main effect of the public-private variable was found, several significant interactions were obtained.
  - a. High status subjects whose initial choice was incorrect had significantly more correct judgments under private than under public conditions.
  - b. Low status individuals, subjected to the low acceptance treatment, manifested significantly more non-conformity under public than under private conditions.
4. Subjects whose initial judgment was correct had a significantly greater number of correct responses on subsequent trials than subjects whose initial judgment was incorrect.

While the hypothesis concerning the effects of experimentally induced status (acceptance) was not confirmed, the results support the prediction that really high status individuals would deviate significantly more from group norms than low status individuals. The necessity for

utilizing cohesive groups in order to demonstrate this relationship was discussed. The effects of induced high and low acceptance and public private treatments were interpreted in terms of their impact upon high and low status individuals. It was pointed out that induced status may not be functionally equivalent to actual status. The importance of considering the relationship between the tendency to persist in one's initial judgment and the direction of the group norm was also discussed.

58 pages. \$1.50. Mic 56-2336

**ESTIMATION OF ITEM DIFFICULTY**

(Publication No. 17,052)

Gordon Fifer, Ph.D.  
Columbia University, 1956

The estimation of item difficulty was studied in relation to the content of the items judged, the professional background of the persons making the estimates, and the relative effectiveness of three arrangements of items of known difficulty provided as information to anchor the estimates. The general plan of the study was to obtain estimates from forty-eight judges of the difficulty of multiple-choice test items designed to measure achievement in word meaning, arithmetic computation, and social studies. The test items were taken from educational achievement tests designed for use in Junior high schools. The word meaning items were used to obtain a measure of the estimation ability of the judges prior to obtaining their estimates of the difficulty indices of the subject-matter items. Arithmetic-computation and social-studies items were used to have test items from two markedly different subject-matter content areas.

Judges. The forty-eight judges included teachers, supervisors, and administrators, half of whom had training and experience in teaching arithmetic and half in social studies. None of the judges had training in test construction or educational measurement, and, in general, they had little acquaintance with standardized tests.

Test Material. The test items and their difficulty indices were obtained from the recent standardization of the Stanford Achievement Test, Advanced Battery.<sup>1</sup>

Three twenty-item sets of both arithmetic-computation and social-studies items were estimated by the judges with the aid of each of the three anchor arrangements. The three nine-item sets of arithmetic items used as anchors were matched closely, item for item, by difficulty and process measured. The three nine-item sets of social-studies items were similarly matched.

Experimental Design. The experiment was designed to obtain estimates from each judge of all six item-sets using the associated anchor arrangement as information. Estimates were obtained in the six possible orders of anchor presentation and in both orders of item content. Each set of items was judged separately.

All judges received:

1. A definition of difficulty,
2. A description of the pupils to be considered,
3. A suggested procedure, and
4. A list of things to look for in estimating difficulty.

The difficulty of a test item was defined as the percentage of 8th-grade pupils who would answer the item correctly at the end of the 8th grade.

Findings. The results of the study were presented in terms of the mean absolute differences between the known difficulty indices of the items and the judges' estimates of these indices. The main findings of the study were:

1. Item difficulty estimation was significantly affected by the arrangement of anchor-item data provided as information,
2. The effectiveness of a particular arrangement was significantly related to the actual difficulty level of the items judged,
3. Arithmetic-computation items were more accurately judged than were social-studies items by judges regardless of background,
4. Ability to judge items in a particular subject-matter area was not dependent upon the subject-matter background of the judges.

No results contradicting the significant findings of previous research were found, and certain of the results of previous studies were confirmed.

The main implications of the results for test construction were:

1. To be most effective, a set of anchor items should have actual difficulty indices distributed evenly in terms of percentile points throughout the range of difficulty,
2. In obtaining difficulty estimates of items of relatively uncomplicated subject-matter content, judges' acquaintance with the population considered is probably more important than is their knowledge of the subject-matter.

The generality of the results of the study were limited somewhat by the qualifications of the judges and by the nature of the test material used. Further research was suggested that would test the effectiveness of providing each judge with information in the form of a specific indication of his individual tendency to be biased in his estimates.

120 pages. \$1.50. Mic 56-2337

1. The items were used with the permission of the World Book Company, Yonkers, N. Y.

#### PREDICTING THE BEHAVIOR OF CHILDREN IN A COMPETITIVE SITUATION

(Publication No. 16,709)

Vernon E. Fisher, Ph.D.  
The Pennsylvania State University, 1956

Background and problem. The problem of the reliability and validity of predictive judgments of behavior is conceived of as important to contemporary psychology. Previous research in this area has suffered from a vagueness and inconclusiveness of results due primarily to a lack of objective criterion variables and in asking the judges to make predictions outside of the range of their capacities. The general hypothesis guiding the present investigation was that consistent individual differences in the ability to

accurately predict behavior can be demonstrated under certain conditions. Specific hypotheses concerned the effect of the length of the preobservational period before actual predictions were made; the effect of the type of the activity on the part of the subjects to be judged during the preobservational period; and the influence of the sex of the interacting members of pairs of subjects judged.

The procedure. The present investigation consisted of twelve independent studies. In each study, approximately ten randomly selected college students made predictions concerning the behavior of two pairs of interacting ten- and/or eleven-year-old children. The children, or players, engaged in competitive tasks in which they had to choose a level of difficulty at which to compete and who they thought would win the game. The college students, or judges, were concealed observers and predicted the choices of the children. The actual choices by the children served as the criterion of accuracy of prediction.

Results and conclusions. The general hypothesis was confirmed. In evaluating the specific hypotheses, it was found that significant individual differences appeared under the following conditions: 1) a fifteen minute period of preobservation, 2) free play during the preobservation period, 3) structured play during the preobservation period, 4) when pairs of male subjects were judged, 5) when the combined results from all sexually homogeneous pairs of subjects were considered.

The following conditions failed to yield significant individual differences: 1) a five minute period of preobservation, 2) when the subjects were interacting pairs of females, 3) when the subjects were sexually heterogeneous pairs.

The results of the present investigation and other similar studies will eventually be utilized in the development of an objective device for the valid and reliable measurement of individual differences in the ability to accurately predict the behavior of others.

#### VITA

Vernon E. Fisher was born on February 22, 1929 in New York, N. Y. He graduated from the Idaho Falls, Idaho, Senior High School in 1947. The A.B. degree was granted by Stanford University, California in 1951. From The Pennsylvania State University he received an M.S. degree in 1954 and a Ph.D. degree in 1956. His specialization for all degrees was psychology. He served as a Veterans Administration trainee in clinical psychology from 1953 to 1956. During the academic years of 1951-1952 and 1952-1953 he held a position as dormitory counselor at The Pennsylvania State University.

99 pages. \$1.24. Mic 56-2338

#### AN EXPERIMENTAL COMPARISON OF THE RELATIONSHIP BETWEEN CLIENT AND THERAPIST IN A REFLECTIVE AND A LEADING TYPE OF PSYCHOTHERAPY

(Publication No. 16,710)

Donald Herbert Ford, Ph.D.  
The Pennsylvania State University, 1956

Statement of the Problem. The purpose of the present study was to examine differences in the relationship formed

between clients and their therapists during the process of two brief verbal psychotherapies or during the early stages of longer psychotherapy.

Independent Variables. The effects of two independent variables were examined in this study. The first was the verbal behavior of the therapist. Therapists were required to administer either a leading or a reflective type of psychotherapy. The second was the therapist as an individual. Ten therapists were used in this study. They were all experienced graduate students taking advanced courses in psychotherapy.

Dependent Variables. Four measures of the relationship which formed between client and therapist during the course of psychotherapy were constructed for use in this study: a Client Personal Reaction Questionnaire containing 40 items reflecting clients' defensive reactions to therapy or therapists; 40 items reflecting clients' positive reactions; and a Therapist Personal Reaction Questionnaire of 35 items reflecting therapists' negative reactions to therapy and client.

Most of the clients were young adults in their twenties whose symptoms were primarily neurotic in character.

Procedures. Clients were randomly assigned to therapists and to the two therapies. Therapists met their clients in 45 minute interviews twice a week on nonconsecutive days. All interviews were recorded on discs or tapes. Both the clients and therapists completed their respective Personal Reaction Questionnaires at the end of the fourth and eighth interviews or when the client terminated therapy, whichever came sooner. The clients were never told they were participating in an experiment. All procedures were handled as a part of regular clinic routine. Therapists knew nothing about the variables or questions being explored.

Statistical Design. A double classification analysis of variance design was used in the experiment. Correlations between pretherapy measures on clients and the dependent variables were explored on the possibility that analysis of covariance might be used to increase the precision of the experiment. Since significant correlations were not obtained for this purpose, analysis of variance techniques were used.

Results and Conclusions. Analyses of Variance were completed on two samples. The first included 24 clients of the six therapists who met the criterion for differentiating treatments. The second sample included the 40 clients of all ten therapists. It was found that including the clients of the four therapists who did not meet the criterion introduced error variance which tended to obscure the treatment effects. Therefore, the analyses reported in this summary are based on the smaller sample.

The data support the following six conclusions.

1. The data provide no support for the belief that clients view the relationship differently in different types of psychotherapy.

2. The data provide no support for the belief that therapists view the relationship differently in different types of psychotherapy.

3. There is some evidence that clients view both the positive and defensive aspects of the relationship differently among therapists. The evidence suggests that differences in defensive reactions tend to disappear as therapy progresses while differences in positive reactions take several interviews to develop.

4. The data indicate that therapists differ initially in

their negative reactions to clients but that these differences tend to disappear as therapy progresses. Therapists apparently do not differ in their positive reactions.

5. The data indicate there are consistent differences in clients' positive and defensive reactions to the interaction of therapists with the type of therapy being given.

6. The data do not support the idea that therapists differ in their view of either the positive or negative aspects of the relationship as a result of therapist interacting with the type of therapy being given.

Two other conclusions seem justified. The consistently significant findings with the Client Personal Reaction Questionnaire are evidence that this instrument is sensitive to some of the things which happen in psychotherapy and therefore may merit further refinement and use. The consistently significant findings resulting from the interaction factor in this experiment emphasize the importance of multivariate designs in studies of psychotherapy.

#### VITA

Donald Herbert Ford was born August 15, 1926 in Sioux City, Iowa. He attended grade school and high school at Marysville, Kansas, graduating from high school in 1944. He received his Bachelor of Science degree with a major in mathematics in 1948 and his Master of Science degree with a major in psychology in 1950 from Kansas State College, Manhattan, Kansas. He received his Doctor of Philosophy degree in clinical psychology from The Pennsylvania State University in 1956. He was on active duty with the United States Army Air Force from 1944 to 1945 in the cadet training program and received an honorable discharge in 1945.

From 1948 to 1952 he held positions at Kansas State College as Director of the Temporary Student Union, Assistant Dean of Students, and Counselor in the Counseling Bureau. From 1952 to 1956 he held positions at The Pennsylvania State University as Counselor in the Division of Intermediate Registration, Counselor and Instructor in the College of Business Administration, and Instructor in the Department of Psychology.

He was married in 1948 and has three children.

171 pages. \$2.14. Mic 56-2339

#### THE EFFICACY OF TWO KINDS OF THERAPIST VERBAL BEHAVIOR IN LIFTING REPRESSION

(Publication No. 16,713)

Jesse E. Gordon, Ph.D.  
The Pennsylvania State University, 1956

#### Statement of the Problem

Empirical research in psychotherapy is frequently inadequate because of failure to control or specify all classes of variables affecting the research: patient variables, therapy variables, and outcome variables. Practical and ethical considerations make it difficult to achieve control over such variables in clinical situations. There is need for the development of a set of procedures by means of which experimental studies relating to psychotherapy can be made, using non-patient subjects. The purpose of this research was to test a set of procedures, developed to

meet this need, by applying them to a specific set of variables.

The therapy variables with which this research was concerned are therapist Leading and therapist Following, defined in terms of whether the initiative in developing the interview conversation was left to the interviewer or was reserved for the therapist. The outcome variables were the lifting of repression, measured as the speed and extent of recall of the content of an hypnotically-induced paramnesia, and interpersonal functioning, measured by the speed with which negative transference to the therapist was developed, and judgments of the subjects' hostility toward the therapists.

Subject variables were limited by the screening of hypnotically-susceptible male volunteers, and by the hypnotic induction of a standard paramnesia in all subjects. Subjects were permitted freedom to respond to the paramnesia (a mildly upsetting experience) in their own idiosyncratic ways, in order to insure realism and the applicability of the findings to clinical situations.

#### Procedures

Eighteen male students of The Pennsylvania State University were screened out of a larger group as hypnotically susceptible. Through hypnosis, the subjects were made to believe that they had undergone a mildly upsetting experience with a high school physical education teacher, and were instructed not to remember the experience in the waking state. Subjects were then randomly assigned to the Leading or Following condition, which determined the nature of the therapy-type interviews in which each subject participated for fifty minutes.

Therapists were nine graduate students in clinical psychology at The Pennsylvania State University, who were not aware of the nature of the experiment, although they knew the subjects had been hypnotized. Each therapist appeared once in each condition, and the dependent measures were expressed as differences between each therapist's two subjects.

#### Conclusions

1. Leading tended to produce greater recall than Following, but the difference did not reach statistical significance.
2. There were no demonstrated significant differences between the treatments in terms of speed of recall.
3. The speed with which negative transference was developed did not differ significantly between the two kinds of therapy.
4. There is evidence that Leading resulted in an extent of recall nearer to the subjects' abilities to recall than did Following.
5. Differences among therapists in their effectiveness in lifting repression were significant.
6. Therapists did better with their first subjects than with their second subjects, in terms of speed of the subjects' recall. This was probably a result of incorrect therapist hypotheses based on their first subjects.
7. Global judgments of hostility were found to be too unreliable for use. This seemed to be due to the great individual differences in the subjects' ways of expressing hostility.
8. Clinical analysis of the interview recordings indicates that subjects responded realistically to the "repressed" experience, and revealed many examples of dy-

namic defensive reactions. Insight into such defenses was facilitated by the knowledge the experimenter had of the experience to which the subjects were unconsciously responding.

9. There is evidence that client "insights" accepted by him and by the therapist as successful progress may not be true statement of the client's experiences.

#### VITA

Jesse E. Gordon was born January 13, 1930. He graduated from James Monroe High School, New York City, in 1946. In 1951 he received a B.S. in English Education from New York University, and an M.A. in Guidance from the same school in 1952.

He served as instructor and psychologist in the Army from 1951 to 1953.

He received the Ph.D. in Psychology from The Pennsylvania State University in 1956, and is a lecturer at The University of Wisconsin, under the auspices of the U. S. Public Health Service. 167 pages. \$2.09. Mic 56-2340

#### CLIENT DEPENDENCY, GUARDEDNESS, OPENNESS, AND RESISTANCE IN A REFLECTIVE AND IN A LEADING PSYCHOTHERAPY

(Publication No. 16,714)

Bernard G. Guerney, Jr., Ph.D.  
The Pennsylvania State University, 1956

#### Purpose

The purpose of the investigation was to compare experimentally the effects of a reflective and a leading type of psychotherapy upon clients in the opening phase of therapy. The client reactions studied were dependence, openness, guardedness, overt resistance, covert resistance, and the proportion of overt to total resistance. The effect upon the client of the interaction of the therapist as an individual with the type of treatment he employed was also investigated in terms of these variables.

#### Experimental Design and Procedures

A double classification analysis of variance design was utilized. The two types of therapy constituted one class of independent variables and ten different therapists constituted the other. Each therapist had two clients under each type of therapy. The 40 clients had requested psychotherapy at a university clinic. They were assigned to a treatment and to a therapist by strictly random procedures. The samples were not biased by exclusion of clients who did not prove amenable to the therapy. A classification system was developed to permit classification of clients' verbal behavior, as heard on recordings of therapeutic interviews, into categories operationally defining the dependent variables. The unit of response was the client's "verbal behavior" between two therapist responses, or every 15 seconds thereof. The client's score on a dependent variable was the per cent of all of his responses that was classified under the category representing that variable. The reliability of the classification system was determined

through inter-judge agreement and, in addition, the client's score on each variable was correlated with a rating given the client by his therapist on the same variable. Data were taken from the fourth or terminal interview, whichever came sooner. A chance probability of less than .05, on a two-tailed test, was the criterion for rejection of the null hypothesis.

#### Results

The 40 records analyzed contained 6,468 client responses. Of these, 1,891 (29.02 per cent) fell into one of the dependent variable categories. For all 40 clients the percentages of total client responses were distributed as follows: Dependence, 2.40; Openness, 4.34; Guardedness, 5.18; Covert Resistance, 16.46; Overt Resistance, .64. Mean scores were greater in the Leading Therapy for client Dependency, Guardedness, Overt Resistance, and for the Proportion of Overt to Total (Overt plus Covert) Resistance. Mean scores were greater in the Reflective Therapy for client Openness and Covert Resistance. However, the null hypothesis could not be rejected with respect to any of these variables. The probability of the F ratio revealing the effect of the interaction of the therapist with the type of therapy he employed, was less than .05 for client Guardedness, but not for the other variables.

#### Conclusions

The results of the experiment do not support the view that a reflective and a leading type of psychotherapy engender differential reactions, early in therapy, with respect to client dependency, openness, guardedness, overt resistance, covert resistance or proportion of overt to total resistance. The results support the view that the interaction of the therapist as an individual with the type of therapy he is employing has an effect upon the degree of client guardedness. The findings do not support the view that such interaction has an effect upon the remaining dependent variables.

Secondary conclusions are as follows: a) a classification of client verbal behavior into operationally defined categories of Dependence, Openness, Guardedness, Covert Resistance, and Overt Resistance can be accomplished reliably and objectively through coding client responses directly from recordings of therapeutic interviews; b) measurements of client dependence, covert resistance, and overt resistance using this system of classification, are in accord with therapists' evaluations of their clients on these same variables; c) clients who do not remain in therapy past the opening phase exhibit more overt resistance within the therapeutic interview than clients who remain in therapy.

#### VITA

Bernard G. Guerney, Jr. was born in Brooklyn, New York on February 28, 1930. He received a B.A. degree from Brooklyn College in 1951, graduating cum laude, with Honors in Psychology. He received an M.S. degree in 1953 and a Ph.D. degree in 1956, from The Pennsylvania State University where he majored in Clinical Psychology. He was a Dormitory Counselor, and as a Graduate Assistant he worked in the Human Factors Research Program and in the Psychological Clinic of The Pennsylvania State Univer-

sity where, later, he was an Assistant Supervisor. He interned at the Wichita Guidance Center, Wichita, Kansas.

172 pages. \$2.15. Mic 56-2341

#### **DIFFERENTIAL EFFECTS OF CERTAIN THERAPIST CHARACTERISTICS ON CLIENT REACTIONS TO PSYCHOTHERAPY**

(Publication No. 16,715)

Louise Fisher Guerney, Ph.D.  
The Pennsylvania State University, 1956

#### Purpose

This study was undertaken with two major purposes. The first was to examine experimentally some of the differences which exist among therapists in the ways they affect their clients during the early stages of psychotherapy. The second was to explore the possibility that the different ways in which they affect their respective clients might be related to certain personal characteristics of the therapists themselves.

#### Experimental Design and Procedures

The basic statistical model was a double classification analysis of variance design. The two independent variables used were the verbal behavior of the therapist and the therapist as an individual. The two kinds of verbal behavior or treatments were designated as Reflective Therapy and Leading Therapy and were differentiated in terms of lesser and greater degrees of therapist intervention respectively, as well as the form of the therapist's response. The same therapists administered both therapies, having been given special training in the differentiation of the two. Which treatment would be administered to which client was determined by the random assignment of clients to both treatment and therapist by means of a table of random numbers.

Therapists were ten advanced graduate students. Clients were 40 individuals who came to The Psychological Clinic of The Pennsylvania State University between February and May 1955. Twenty were assigned to each treatment.

Fourteen dependent variables were used to investigate the differences among therapists in the effects they had upon their clients. Two were measures of the relationship combined into one questionnaire known as the Client Personal Reaction Questionnaire. Six were measures of client reactions in the therapy interviews. These were the amounts of verbally expressed Dependency, Guardedness, Covert Resistance, Overt Resistance, Openness, and Defensiveness. Six were measures of change in client attitude and adjustment constructed from The Minnesota Multiphasic Personality Inventory and administered to clients before and after therapy. Analysis of variance was used for the statistical analyses of these measures.

Variables investigated in the second aspect of the study, therapist personal characteristics, were: (1) Ability to Enter the Phenomenological Field of Another, (2) Sympathetic Interest, (3) Acceptance of Others, (4) Social Stimulus Value, (5) Need for Aggrandizing the Self, (6) Aggres-

siveness. Measures for assessing the therapists' Ability to Enter the Phenomenological Field, Acceptance of Others, and Social Stimulus Value were developed specifically for the present study. The other characteristics were assessed by means of variables from the Edwards' Personal Preference Schedule.

The relationship of these therapist personal characteristics to client reactions to therapy were examined by means of Pearson correlations. Five client reaction variables were correlated with the therapist characteristic variables, two measures of the relationship, Defensiveness and Guardedness expressed in the interview, and change on the Maladjustment Index scores shown from pre to post therapy.

#### Results and Conclusions

The analyses of variance on the 14 measures used to explore the question of differences among therapists yielded only two F ratios high enough to meet the .05 level of significance required for this study. These occurred on the measures of Defensiveness in the relationship and Guardedness in the therapy interview, providing some evidence for the belief that individual therapists establish relationships which differ in the degree of defensiveness experienced by clients, and which evoke different degrees of guarded behavior of clients during the interview.

None of the correlations among the therapist personal characteristics and client reactions to therapy met the required level of significance. Support is thus denied for the existence of any of the proposed relationships between the six personal therapist characteristics studied and the relationship, Guardedness, Defensiveness, and change in Maladjustment shown by their clients.

#### VITA

Born July 10, 1928 in Philadelphia, Pennsylvania, Louise Fisher Guerney received the A.B. degree from Temple University in 1948. She was employed as Junior Psychologist at the Newark State School in Newark, New York until 1951. She received the M.S. degree in Psychology in 1953 from The Pennsylvania State University. From 1953 to 1954 she interned at the Wichita Guidance Center, Wichita, Kansas. While completing graduate work she was employed as Assistant to the Director of The Division of Intermediate Registration of The Pennsylvania State University. She was awarded the Ph.D. degree in Clinical Psychology by The Pennsylvania State University in January, 1956. Her publications are: Group Therapy of Mental Defectives, American Journal of Mental Deficiency, Volume 57, January 1953; The Value of The Thematic Apperception Test in Mental Deficiency, Psychiatric Quarterly Supplement, Part 1, 1953. 233 pages. \$2.91. Mic 56-2342

#### INFLUENCE OF GROUP-CENTERED THERAPY AND MENTAL HEALTH FILMS ON ATTITUDES OF PRISONERS

(Publication No. 16,716)

Byron Lynn Harriman, Ph.D.  
The Pennsylvania State University, 1956

The present study was designed to determine whether group-centered therapy and selected mental health films,

used alone and in combination as treatment methods, would bring about measurable changes in the following attitudes of prisoners: (a) enjoyment of interpersonal relationships, as measured by a revision of Morris' Gripe Scale; (b) emotional stability and (c) strength of character, as measured by Cattell's Ego Strength and Superego Scales; (d) understanding motives and feelings of self and others, (e) estimate of personal worth, and (f) hostility, as measured by Edwards' Intraception, Abasement, and Aggression Scales.

The volunteer subjects, eighty-seven selected "first offenders," were randomly assigned to these experimental conditions within a 2 X 2 table: (a) group therapy, (b) film showings, (c) films followed by group therapy, and (d) no treatment. The final n's were 23, 19, 19, and 20.

The mean age of the N of 81 was 31.6; its mean grade achievement, 8.0; its mean reading speed, equivalent to 8.7 grade placement; and its mean intelligence test score, equivalent to an IQ of 93.

An analysis of variance method which allowed for disproportionate n's was applied to means of differences between pre- and posttest scores obtained on each scale.

The treatment schedule was as follows: (a) Each of two therapy subgroups met semi-weekly for sixteen one-hour sessions. (b) The films group met semi-weekly to view sixteen mental health films. (c) The films-and-therapy group met semi-weekly as a unit to see the identical films. In addition, two subgroups met for a one-hour group therapy session following each showing.

A detailed anecdotal record in journal form was kept of all therapy sessions. The therapist was essentially non-directive, striving in so far as possible to make statements which represented simple acceptance, restatement of content, reflection of feeling, and clarification of feeling.

The films employed were carefully selected from a total of forty-nine previewed. Each was rated on the basis of seventeen criteria, and a pilot study was conducted to determine prisoner reactions to several of the films under consideration. The sixteen chosen were non-moralistic, documentary, and in general utilized a case-study approach to convey an understanding of factors contributing to delinquent and otherwise aggressive behavior. In order not to introduce contaminating variables, they were presented without either introduction or opportunity for discussion.

Analysis of variance of the differences between pre- and posttest scores for the six scales failed to yield F-ratios significant at the five per cent level. Thus, the following summary statement was supported:

1. Attending group-centered therapy sessions, viewing selected mental health films, and viewing films supplemented by group-centered therapy did not effect changes in attitudes measured by the scales utilized.

The subsequent statements, based on observations and clinical impressions, are intended to serve as hypotheses:

2. Group-centered therapy tends to mitigate suspicion toward the therapist.
3. Prisoners challenge the therapist by direct questioning.
4. Frustrations aggravated by prison conditions cause group members to deride fellow inmates.
5. Free expression in meetings serves to reduce bitterness.
6. Inmate leadership within the group has greater influence than the ancillary use of films.
7. There is progression from destructive to constructive criticisms interspersed with attempts to understand personal behavior.
8. Attitudes of personnel toward inmates influence the effectiveness of therapy.
9. Aggression, suppressed prior

to treatment but expressed in therapy, is likely to spread to other relationships within the prison. 10. Films on delinquency are more threatening and consequently elicit less discussion than those on other subjects. 11. Films dealing with adult offenders should be used to supplement those concerning delinquents. 12. Sympathetic film presentations of delinquents may encourage projection. 13. Sex offenders commonly have feelings of guilt. 14. Guilt feelings may be indicated by insistence upon the importance of heredity. 15. Group-centered therapy prepares inmates for individual therapy and indicates which members should profit most from continued treatment. 16. When group members request supplementary individual treatment, the combined methods will accelerate psychotherapy.

#### VITA

Byron Lynn Harriman holds degrees of B.A. and M.Ed., University of New Hampshire, 1938 and 1939; M.A., University of Pennsylvania, 1941; Ph.D., The Pennsylvania State University, 1956. He was Army Psychiatric Social Worker, 1942-1946; Vocational Appraiser, Philadelphia Veterans Center, Philadelphia Board of Education, and Temple University, 1946-1950; Assistant Professor and Acting Head, Department of Psychology, Lebanon Valley College, 1950-1953; Counseling Psychologist, Lebanon Veterans Administration Hospital, 1953-1954; Assistant Supervisor, The Pennsylvania State University Psychology Clinic, 1954-1955. 206 pages. \$2.58. Mic 56-2343

#### A CONTROLLED INVESTIGATION OF THE EFFECTS OF RESERPINE (SERPASIL) ON ADJUSTMENT AND TENSION IN HOSPITALIZED MALE PSYCHOTICS

(Publication No. 16,721)

Robert J. Jones, Ph.D.  
The Pennsylvania State University, 1956

The object of the study was to conduct a controlled investigation of the effects of reserpine on adjustment and tension in hospitalized male psychotics. A theoretical framework suggested by O. H. Mowrer provided a basis for formulating several testable hypotheses, which, if borne out, would prove valuable in understanding the nature of the therapeutic process.

The subjects were forty-five psychotic patients. Three groups, each made up of fifteen patients, were formed by means of a random selection procedure. These were designated as the reserpine, placebo, and regular-ward-routine groups; and the subjects included in each were started on their assigned regimens in alphabetical order. A staggered testing sequence was used throughout the study. At the end of an 84-day medication period, paired members of the reserpine and placebo groups had received exactly the same number of tablets, either containing reserpine or made up entirely of inert substance.

In all, five evaluations, including pre-, post-, and follow-up testings, were conducted at 28-day intervals. Measuring devices included the Hospital Adjustment Scale, Rotter Level of Aspiration Test, Discomfort-Relief Quotient, and a revised short form of the Taylor Manifest Anxiety Scale.

Portions of the data were treated by the analysis of covariance and analysis of variance methods. Difference scores were computed for the various measures of adjustment and tension, and these were then correlated in order to determine the degree of relationship existing between changes occurring during specified intervals throughout the course of the study.

#### Results and Conclusions

1. Reserpine, when administered to psychotics in moderate doses for approximately three months, did not produce statistically significant changes in the measures of adjustment and tension used in the study. Therefore:

a. The psychotic patient's adjustment to his hospital environment was not increased by the administration of reserpine.

b. Distance from reality was not decreased by reserpine therapy.

c. Tension was not initially raised and, after reaching a peak, then lowered by the continued use of reserpine.

d. Manifest anxiety was not initially raised and, after reaching a peak, then lowered by the continued use of reserpine.

2. An apparent significant difference in Discomfort-Relief Quotients obtained by the placebo and regular-ward-routine groups must be interpreted with caution; however, it may indicate that extra attention involved in receiving medication, rather than the action of reserpine, was responsible for any change in tension which occurred.

3. Those changes in measures of adjustment and tension which did occur during reserpine therapy were not significantly related to each other. Therefore:

a. In the course of reserpine therapy, a positive relationship between changes in hospital adjustment and tension (or anxiety) was not found initially; furthermore, a negative relationship was not noted later in therapy.

b. In the course of reserpine therapy, a negative relationship between changes in distance from reality and tension (or anxiety) was not found initially; furthermore, a positive relationship was not noted later in therapy.

4. The findings did not impugn the validity of Mowrer's theoretical formulation, since, in most cases, the therapeutic process seemed never to have progressed to a point where significant changes in adjustment and tension would be expected.

#### VITA

Robert J. Jones was born in Philadelphia, Pa., on February 25, 1926. He graduated from Roxborough High School and entered the Army Specialized Training Reserve Program at the Carnegie Institute of Technology in November 1943. In May 1944, he transferred to the Army Air Corps, serving as an aerial gunner and instructor until February 1947. In June 1951, he received the B.A. degree in psychology from Franklin and Marshall College, and in June 1952, the M.S. degree in psychology from The Pennsylvania State College. He received the Ph.D. degree in psychology from The Pennsylvania State University in January 1956.

While a doctoral candidate at The Pennsylvania State University, he was a clinical psychology trainee at the Veterans Administration Hospital, Lebanon, Pa., and in August 1955, he was transferred to the Veterans Administration Hospital, Coatesville, Pa., where he completed his training.

104 pages. \$1.30. Mic 56-2344

**A PSYCHOLOGICAL ANALYSIS OF THE SPIRITUAL DIRECTION GIVEN BY FRANCIS OF SALES**

(Publication No. 17,034)

Frank Walter Kimper, Ph.D.  
Boston University School of Theology, 1956

Major Professor: Dr. John Dixon Copp

The purpose of this dissertation is to examine the spiritual direction given by Francis of Sales in terms of his own understanding of the dynamic processes involved which make for growth; to analyze these dynamics in the light of psychological insights reported by O. Hobart Mowrer on learning theory and from Harry Stack Sullivan's discussion of interpersonal relations; and to compare the findings with pastoral counseling as presented by Seward Hiltner to determine which contributions spiritual direction may have to make to present-day pastoral counseling.

The motivation in spiritual direction as practised by Francis of Sales is found to be the desire for self-fulfilment aroused by the contrast between the person's perception of the perfect love of God and his perception of his own imperfection. As the person's value-system becomes identified with his perception of the will of God, the desire for the approval of God (conscience satisfaction) is the powerful motivation for the person's seeking to be perfect in love. This points to the significance of the relationships in spiritual direction. The perceived loving-kindness of God, and the gentle acceptance of the spiritual director, provide the person with the kind of psychic security which allows him to examine his emotions and motives, and gain new understanding of himself and his interaction with others. The result is spiritual growth.

These are the dynamics involved in pastoral counseling as well. The pastor as counselor helps the person to help himself, responding in ways that communicate understanding, clarify issues and feelings, and consolidate insights. The aim is to resolve an immediate critical problem through the person's changing perception of himself and his relations with others. The result is an emotional adjustment which makes it possible for the person to deal with the troublesome aspects of his life-situation creatively.

Summarized, the conclusions are as follows: (1) Spiritual direction, like pastoral counseling, is a therapeutic experience. All the psychological conditions necessary to set in motion the processes by which therapy takes place in personality development are present in both, the dynamics involved are the same, and the resultant growth can be judged by identical criteria. (2) However, in spiritual direction all behavior is viewed in the light of the person's immediate relationship with God, for in spiritual direction the person's relationship with God is the primary relationship. This is significant: (a) because awareness of relationship with God enlarges the person's perspective so that he sees his immediate problem in the light of wider or even ultimate possibilities. He sees in himself the possibility of becoming perfect in love, and of participating with others in a community of love, which motivates creative striving far beyond the demands of his current problem; (b) because awareness of relationship with God broadens the meaning of personal acceptance. In the assurance that God loves him the person learns to feel secure everywhere, all the time. He is persuaded that God is constantly sup-

porting his efforts to be loving in all his relationships, and gains an emotional freedom which permits a more creative approach to every experience of life; (c) and because awareness of relationship with God makes therapy, not a momentary attempt to make a limited adjustment to an immediate distress, but a continuous process of development through the practice of prayer and mortification for the rest of the person's life. (3) The value of a more explicit reference to the person's relationship with God (which characterizes spiritual direction) should be studied by Protestants with the possibility in mind that the practice of pastoral counseling might be enriched by sharpening the focus upon God. 234 pages. \$3.05. Mic 56-2345

**A STUDY OF PERCEPTUAL DEFENSE AS A PARADIGM FOR REPRESSION**

(Publication No. 16,732)

Hugh B. Urban, Ph.D.  
The Pennsylvania State University, 1956

**1. The Problem.**

This study was undertaken to investigate the usefulness of the Perceptual Defense hypothesis as a paradigm for the clinical concept of repression.

The investigation involved three steps: the conceptual relation of the two constructs, the establishment of a rigorous experimental test of perceptual defense, and the evaluation of the theory to account for behavior thought to be concomitant with repression.

A review of the literature revealed the prerequisites for an experimental substantiation of perceptual defense. These involve establishing the antecedents in learning, by pairing punishment with the act of perceptual reading; the control of all known determinants of perceptual thresholds with punishment becoming the independent variable; and the demonstration of a central cognitive process of defense in learning, perception and memory.

To test the adequacy of perceptual defense as a model for the repressive process, two additional variables were selected for independent variation: conscious and thought-mediated punishment versus direct and unconsciously experienced punishment, and the variable of delay for an incubation effect.

Four hypotheses were evolved which predicted that direct and unconsciously experienced punishment associated with the perception of stimuli would result in a consistent cognitive resistance in learning, memory and perception; that delay enhances this central cognitive resistance; that no central cognitive resistance would be apparent under conditions of conscious, thought-mediated punishment, but rather that conscious and thought-mediated punishment acts to facilitate cognitive functions.

**2. The Experiment.**

Seventy-six student volunteers were randomly assigned to three treatment conditions, a control group, a shock-with-awareness-of-pattern group, and a shock-unaware group. All subjects underwent a succession of five experimental phases: Learning, Immediate Test of Perceptual Thresholds, (Incubation Period of 48 hours), Test of Spontaneous Recall, Second Test of Thresholds, and Relearning.

Electric shock was the condition of punishment; random assignment of subjects, the use of a control group, and the employment of nonsense syllables were methods of control used to obviate the operation of variables previously shown to be determinant of differential recognition thresholds.

The data were subjected to a non-parametric analysis, the Kruskal-Wallis "H" test.

### 3. Results.

Overall differences between the three groups in learning and the two measures of retention were found. However, none of the variables which were independently manipulated sufficed to produce differentials in any perceptual measure.

The effect of shock upon the group which was unaware of the pattern appeared primarily disruptive, with learning and retentive facilities reduced for both the shock-associated syllables and the list as a whole; the effect of thought-mediated punishment (shock with awareness) appeared to be one of facilitation of learning, but of interference with retention.

### 4. Discussion.

The perceptual defense theory as presently formulated was not substantiated. When the antecedent conditions hypothesized by this theory were established, a specific effect of punishment upon its associated items was established, in the cognitive spheres of learning and memory, but not in perception. On an ad hoc basis the results were comprehensible in terms of the effects of anxiety upon learning and retention of complex tasks, such as is reported by the Iowa group of Taylor, Spence and Farber.

### 5. Conclusions.

1. The Perceptual Defense theory requires reformulation as to antecedent conditions and consequent results. The phenomenon failed to be confirmed by this study.
2. The same theory failed to adequately account for consequences ordinarily thought to be associated with repression. The direct application of the theory to the process of repression is presently unwarranted.
3. The exploration of the phenomenon in terms of more sophisticated learning theory appears to be the most fruitful avenue for future research.

### VITA

Hugh B. Urban was born in New Haven, Connecticut, August 13, 1926. He acquired his elementary education at The Foote School of New Haven and his secondary education from the Choate School of Wallingford, Connecticut.

He received an honors degree of A.B. in psychology from Princeton University in 1949 and an M.S. degree in clinical psychology from The Pennsylvania State University in 1951. He served with the U.S. Armed Forces as staff sergeant in the Pacific Theater of Operations.

He has been employed as a research assistant at the Study of Education, Carnegie Foundation, Princeton University (1949) and as a Clinical Assistant at the Division of Intermediate Registration, The Pennsylvania State University (1950-51, 1953-54); Clinical Psychology Intern at the Brattleboro Retreat, Brattleboro, Vermont (1952-53), where he is now Chief Psychologist.

He is an associate member of the American Psychological Association, a member of the American Anthropo-

logical Association, an associate member of the Society of Sigma Xi, a member of Psi Chi and Phi Delta Kappa.

128 pages. \$1.60. Mic 56-2346

### PREDICTING ADJUSTMENT TO LONG PERIODS OF CONFINEMENT: A STUDY IN FACTOR ANALYTIC METHODOLOGY

(Publication No. 13,774)

Benjamin Brunner Weybrew, Ph.D.  
University of Colorado, 1955

Supervisor: Professor K. F. Muenzinger

The present investigation was concerned with the problem of evaluating the effectiveness of several factor analytic designs as applied to the various aspects of the empirical problem of predicting adjustment to long periods of experimental confinement. The overall problem of prediction was broken down into two general problem areas, viz., the problem of constructing adequate criteria of the behavior being predicted and the problem of compiling a battery of tests or measures predictive of these criteria. To the first problem, that of criterion construction, the Q-technique of factor analysis was applied while to the second problem, that of predictor and criterion validation, both R- and Q-techniques were applied in order to evaluate their effectiveness in the prediction setting.

A Q-factorization of the data obtained by correlating the Q-sorts of thirteen experienced submarine officers according to their concept of the "ideal" submariner resulted in three Q-factors. For each of ten traits or behaviors defining the Q-factor "types" a paired-comparison rating scale was constructed. These ten scales plus rating scales for twelve hypothetical dimensions added as referents were then used as a means of obtaining criterion data during the confinement experiment. On the basis of previous research, twenty-nine predictor measures were selected and scores on these measures were obtained from the twenty-two men confined to a deactivated submarine for sixty days. A gross analysis of the  $51 \times 51$  predictor-criterion matrix of validity coefficients showed that tests usually considered as measures of some aspects of intelligence, the Wechsler-Bellevue Test, the Modified Army Beta Test, and the U. S. Navy General Classification and Clerical Tests, were the most valid predictors of the rating criteria. As determined by an R-technique analysis of the  $29 \times 29$  correlation matrix, the factorial composition of the predictor battery was described by five factors in the orthogonally-rotated solution. These predictor factors were a Psychomotor Coordination Factor, a Verbal Comprehension Factor, a Perseveration-Rigidity Factor, a Numbers Manipulation Factor, and a Speed-in-Spatial-Orientation Factor. Similarly, an R-factorization of the  $21 \times 21$  criterion matrix resulted in three common factors, two of which apparently coincided with Cattell's, previously identified, "F" and "G" factors, while the third criterion R-factor was tentatively labeled a Motivation-Temperament Indicator. A Q-factorization of the transpose predictor and criterion matrices resulted in the localization of Q-factor types defining the Verbal Comprehension Factor, previously identified by R-technique. Similarly, a bipolar Q-factor

coincided with the third R-factor, Perseveration-Rigidity; however, only the first criterion R-factor could be identified by the loading configurations of the three criterion Q-bipolars. Q- and R-techniques applied to the same prediction problem seemed to give complementary results in terms of locating the most predictive criterion-predictor factor combination. The difference between Q- and R-methodologies seemed to be a difference in the aims or goals of the two methods rather than a basic logical difference. Whereas "Q" aims at describing the Q-factor types in terms of their patterns of factor endowments, "R" aims at discovering the fundamental dimensions accounting for the variable interactions. By correlating the predictor factor scores with the criterion factor scores, it was clearly demonstrated that the first criterion R-factor (Cattell's "G" factor) was being predicted most significantly by the Verbal Comprehension Factor and, to a lesser extent, by the Numbers and Spatial Orientation Factors.

Two novel uses of factor analysis were demonstrated as useful techniques of analysis of the prediction data. First, a method of defining test validity as the summed cross-products of the loadings of the tests and criteria in the common factors extracted by a composite factorization of the predictor-criterion matrix was demonstrated to be an efficient means of "explaining" predictive validity in terms of the common factor variance shared by the tests and criteria. Second, the trend or fluctuation factors extracted by a P-technique analysis of intercorrelated variables, measured at successive intervals during the confinement period, were shown to differentiate the previously identified Q-factor types.

All of the findings of this study are significant for the applied psychologist desiring a catalogue of the factors most predictive of adjustment to confinement or similar situations. Methodologically, the demonstrated usage of Q-technique as a method of criterion construction, of Q- and R-techniques as functional complements in the prediction setting, and of P-technique as a method of identifying Q-factor types are equally significant for the test constructor, the personality theorist, and the personnel psychologist interested in enhancing the validity of their predictions of specific behavior.

317 pages. \$3.96. Mic 56-2347

#### PREVAILING MOOD AS AN AFFECTIVE DETERMINANT IN PERCEPTION, MEMORY, ASSOCIATION AND ASSOCIATIVE REACTION TIME

(Publication No. 16,610)

Anita H. (Schwartz) Wodin, Ph.D.  
New York University, 1956

Chairman: Dr. Howard M. Newburger

**Problem.** It was the purpose of this research to test hypotheses concerning the operation of homeostasis through perception, memory, the memory trace, word associations and associative reaction time. It was predicted that elated subjects would perceive positive mood-confirming stimulus words more quickly, remember more of these stimulus words immediately and after delayed memory confirm these words with mood-sustaining associations, and react

with an association less quickly to the positive than to negative or non-confirming stimulus words. The converse was also hypothesized.

**Procedure.** The D scale of the Minnesota Multiphasic Personality Inventory and a performance test involving transference of beads from one container to another at individual comfortable rates, reflecting motor norms known to be related to elation and depression, were administered to 148 subjects. Of these, 120 were selected and divided into three equal groups of 40; elated, neutral and depressed sub-group, on the basis of the scores.

Ten subjects in each sub-group were tachistoscopically presented negative and positive words; the time required for identification was recorded. Ten subjects from each sub-group were administered a recall and recognition test immediately after learning the stimulus words. Ten more subjects from each sub-group were administered the memory tests after five minutes delay; the last ten of each sub-group were administered the memory tests ten minutes later.

All subjects, upon completion of one of these tests, were administered the word association test, containing stimulus words, and reaction time scores were recorded.

**Results.** Of the three hypotheses with regard to speed of perception of stimulus words, two were statistically confirmed; all three were in the direction predicted, elated subjects significantly perceived positive words quicker than negative words; there was no difference in the speed of perception for either set of words by the neutral group.

The results for both the recall and recognition tests indicated some influence of prevailing mood. Of the three statistically confirming results, two were in support of the hypotheses.

Of the six obtained differences with regard to the memory trace, five were in the direction predicted. None of these differences, however, was significant.

There was a strong trend with regard to word association to utilize the non-confirming type of association for both positive and negative words. This trend was significant for the negative words for all sub-groups. Of the three obtained differences with regard to reaction time, two were statistically confirmed.

Prevailing mood was not significantly related to age, sex or college year.

When the elated sub-groups were compared with the depressed sub-groups with regard to perception, memory, association and reaction time, all of the obtained differences, except one, were in the expected direction. None of these differences, however, was significant.

**Conclusions.** It was concluded: 1) prevailing mood acts as a determinant in selective perception; 2) prevailing mood may act as a determinant in memory; 3) prevailing mood seems to act as a determinant in memory trace; 4) prevailing mood does not seem to act as a determinant in word association; 5) prevailing mood may act as a determinant in associative reaction time; 6) prevailing mood is not related to sex, age or college year; 7) elated subjects seem to perceive positive words more quickly, remember more positive words, confirm more positive words in their associations, reacting less quickly to positive words than do depressed subjects; 9) depressed subjects seem to perceive negative words more quickly, remember more negative words, confirm more negative words in their associations, reacting less quickly to nega-

tive words than do elated subjects. Finally, it would seem that the prevailing homeostatic mood operates as an affective determinant in various segments of behavior.

127 pages. \$1.59. Mic 56-2348

## PSYCHOLOGY, CLINICAL

### SELF-OTHER IMPRESSIONS OF MOTHERS AND SONS AS A FUNCTION OF THE SONS' SOCIO-PERSONAL ADEQUACY

(Publication No. 17,209)

Jack I. Bardon, Ph.D.  
University of Pennsylvania, 1956

Supervisor: Malcolm G. Preston

#### PROBLEM

This study was designed to investigate self-other impressions of personality among sons and mothers and the processes by which these impressions are formed.

#### PROCEDURE

Two groups of pre-adolescent boys were differentiated on the basis of self-ratings, ratings by peers, and ratings by teachers. Those boys who rated high on all three criteria were considered as being "adequate" in these three respects. Boys who rated low on all three criteria were considered as being "inadequate." The two groups of boys were equated on a number of pertinent extraneous variables.

The boys and their mothers were asked to rate themselves, the other, and what they thought the other would say about them on twenty-two trait-situations. The primary data for investigation are derived from an analysis of various intercorrelations among these interrelationships.

#### RESULTS

In both groups, the correlation between self-ratings of sons and mothers is low.

In both groups, for sons and mothers, the correlation between view of self and other's view of the rater is of a relatively low order.

While both groups of sons and mothers show some tendency to rate the other as similar to themselves, adequate boys and their mothers exhibit significantly higher correlations here than do inadequate boys and their mothers.

While both groups of sons and mothers show a tendency to think the other sees them as they see themselves, mothers of adequate boys exhibit significantly higher correlation here than do mothers of inadequate boys. Although the difference between these correlations for the two groups of boys is not significant, the difference that exists is in the direction of higher correlation for the adequate boys.

For the particular traits used in this study, no consistent patterning or order of magnitude could be discerned which would differentiate one group from the other.

#### CONCLUSIONS

Arguments are presented to show that intercomparison of the correlations studied serve as indirect evidence that the ratings made are being affected by factors other than the objective status of the personalities involved.

The fact that mothers, selected only by reason of their association with their sons, differ in their self-other impressions in regard to their sons in the same way their sons differ in their self-other impressions in regard to their mothers, is taken to indicate that the circumstances of the relationship between son and mother are associated with adequacy in the sons.

It is hypothesized that interpersonal conflict between mother and son differentiate the two groups, conflict being defined as a situation which divides persons into opposing camps in which persons view themselves as either on the same "side" or on different "sides." Since adequate boys and their mothers exhibit higher correlations than do inadequate boys and their mothers for both Assumed Similarity and Assumed Understanding measures, it is contended that their relationship is characterized by relatively less conflict.

In addition to conflict, data are presented which indicate that the two groups differ in realism as well, realism being defined in terms of the correspondence between one's impressions and externally conditioned fact. It is seen that adequate boys and their mothers evidence relatively less realism than inadequate boys and their mothers.

It is hypothesized, further, that realism is positively related to the frequency of conflictual occurrences and negatively related to the moderating effects of feelings of harmony and mutuality upon conflict situations.

92 pages. \$1.50. Mic 56-2349

## PATIENT ATTITUDES IN PSYCHOTHERAPY

(Publication No. 17,021)

Arvord W. Belden, Ph.D.  
The Florida State University, 1956

Four nondirective therapists made recorded interviews with 40 subjects equally divided into the following five groups: Maladjusted college students who asked for therapy, maladjusted college students who did not ask for therapy, well-adjusted college students who did not ask for therapy, maladjusted individuals from the general population who asked for therapy and well-adjusted individuals from the general population who did not ask for psychotherapy. All groups were equated in regard to age, intelligence and sex.

A scale composed of 160 patient attitudes considered to be influential in the success or failure of psychotherapy was used to describe patient attitudes during the first and fourth interviews. These results were then compared with what had previously been judged to be ideal patient attitudes. Fiedler's scale concerned with the idealness of the therapist's relationship to his patient was used to describe the therapist in the first and fourth interviews.

It was found that the more ideal the relationship of the therapist to his patients, the more gains his patients made in attitudes considered ideal for successful psychotherapy and the less the therapist's relationship is influenced by

therapeutically undesirable attitudes on the part of the patient. Results further suggest that both the therapist and patient sustain losses in the idealness of their relationship when the therapist fails to approximate the ideal therapeutic relationship to a sufficient degree or when the patient is well-adjusted and does not ask for therapy. The variables of maladjustment and asking for therapy appear to be the most important patient qualifications for acquiring attitudes considered ideal for psychotherapy. Females and patients from the general population made significantly greater gains in ideal patient attitudes than did males and college patients. Suggestions for further research are cited.

46 pages. \$1.50. Mic 56-2350

**AN ANALYSIS OF PSYCHODYNAMIC PROCESSES  
OF CHANGE IN SMALL GROUP BEHAVIOR  
IN A TEEN-AGE GANG**  
(Publication No. 16,584)

Richard Emanuel Brotman, Ph.D.  
New York University, 1956

Chairman: Professor Brian Tomlinson

It has been recognized by many investigators that unaffiliated street clubs of teen-age youth with varying degrees of spontaneous organization, are frequently involved in conflict with the community and provoke, from time to time, a good deal of censure and alarm. Doing work with street clubs or gangs has been much easier than measuring the effectiveness of what was done and tracing changes in a group where an effort to produce change is present, has been more difficult. This research is an attempt at analyzing the psychodynamic processes of change in small group behavior in a teen-age gang.

This research concerns itself with an analysis of the role played by an area worker in a gang group from the initial contact where the worker is referred to the group to the stage where the group exhibits a decreasing need for help. There is an attempt at detailed description of the methods and techniques used by the area worker in establishing a position in the group which will effect change. A further attempt is made to describe the stages of change through which the worker and the group pass together with the formulation of principles arising out of the application of the treatment process.

Conflict between teen-age gangs in the upper West Side of Manhattan became so overt that police and parents were severely disturbed. Recognizing the need for some program to meet this difficulty, the investigator attempted to test a group approach to gang treatment. Advanced students with adequate experience were selected to serve as workers with these gangs under the supervision of the researcher who was directly responsible for both the action and research phases of the work.

Carefully recorded chronological process records of all contacts with a teen-age street gang were analyzed to determine the changing role of the area worker in the structure of the gang group. Similarities between this treatment process and other types of treatment relationships, particularly the client-centered approach, are discussed as part of the framework.

Each recording was examined by the investigator and indicators were excerpted on the basis of their meaning to the change process. Activity, interactions, and sentiment were the categories of interacting forces for the selection of the indicators which were then interpreted in the light of their effect upon the worker's relationship to the group. Two other experts served as a panel to establish the reliability of the principles regarding the change process.

The steps characteristic of change in the client centered process of counseling occur in the changing relationship of an area worker with a gang group. Street gang members can be reached and respond to sympathy, acceptance, affection, and understanding, when approached by adults who possess these characteristics and who reach out to them on their own level. An area worker playing the role of an accepting adult gains the confidence of an autonomous group which has previously rejected any community effort to help it, by serving as an object to whom the group can relate and through whom they can regain community status. The positive relationship that is established between a worker and the gang can serve as a catalytic agent for modifying anti-social attitudes and behavior.

245 pages. \$3.06. Mic 56-2351

**A STUDY OF SENSORY, MOTOR, AND  
IDEATIONAL PERSEVERATION IN  
SCHIZOPHRENIC AND DIFFUSE  
BRAIN DAMAGED PATIENTS**

(Publication No. 17,217)

Natalie L. Brown, Ph.D.  
University of Pennsylvania, 1956

Supervisor: Dr. Seymour Feshbach

This experiment was designed to investigate the pattern of perseveration in a group of individuals with diffuse organic brain damage, a group of schizophrenics and a group of controls. Two sensory, two motor, and three ideational tests were administered for this purpose. Each group was composed of fifteen subjects, and the groups were matched for age and intelligence. All subjects were tested individually, and were given two separate administrations of each of the total of seven tests, the order of presentation of tests being randomly varied from administration to administration.

The specific hypotheses tested were:

1. A group of individuals with diffuse organic brain damage will show higher degrees of perseveration on the sensory tests of perseveration than either a schizophrenic or control group.

2. A group of individuals with diffuse organic brain damage will show higher degrees of perseveration on the motor tests of perseveration than either a schizophrenic or control group.

3. A schizophrenic group will show higher degrees of perseveration on the ideational tests of perseveration than either an organic or control group.

The results indicated that hypotheses 1 and 2 were supported. The organics exhibited significantly greater sensory and motor perseveration or lag than either of the other two groups. The third hypothesis was not borne out

by the obtained results. The schizophrenics did not show significantly higher degrees of ideational perseveration. Rather, the organics again perseverated significantly more than the other two groups, with no significant differences found between the schizophrenics and controls.

It was found that the rank intercorrelations between tests of any one area with tests of another area for each group separately showed no consistent pattern of significant correlations. It was also found that the intercorrelations between tests within any one area again tended to show no reliable pattern of significant correlations.

The results were discussed in terms of the specific tests utilized. In addition, the hypothesis was offered that previous reports of perseveration in schizophrenia may be analyzed in terms of the effects of prolonged institutionalization. Also, the low intercorrelations were discussed in terms of the notion that the functions underlying the perseverative behavior in various areas are specific to the area and do not represent a single underlying general function.

61 pages. \$1.50. Mic 56-2352

#### A SYSTEMATIC INVESTIGATION OF SENSORY DISCRIMINATIONS IN HUMAN BRAIN DAMAGE

(Publication No. 13,760)

Robert Charles Cannon, Ph.D.  
University of Colorado, 1955

Supervisor: Assistant Professor Howard E. Gruber

In the study of human brain damage various commonly employed tests of global psychological functions have proved of limited value, both for differential diagnosis and for the study of cerebral mechanisms. The purpose of the present study, therefore, was to investigate the effects of brain damage on a restricted group of relatively simple psychological functions.

The method used was to compare the brain-damaged person's ability to make intermodal discriminations with his ability to make intramodal discriminations. It was hoped that this technique might distinguish impairments localized in a single sensory field from impairments in the communication between specific sensory fields. The data from various types of successive discrimination were supplemented with data from neurological examinations and from tests designed to detect any distortion of sensory input.

The sensory fields employed were the nasal and temporal visual fields of the right eye, the right and left auditory fields, and the right and left cutaneous fields (palms). The stimuli were rhythmic patterns fashioned after Morse code symbols. Each sensory field was combined with itself and with each of the other sensory fields, making a total of 36 subtests or types of successive discrimination. A four- or five-part rhythm presented to one sensory field was followed either by an identical or a slightly different rhythm presented either to the same or to a different sensory field. The subject's task was to judge whether the two rhythms were the same or different. Six rhythm pairs were presented to each of the 36 sensory field combinations.

There were three groups of subjects: 27 hospitalized brain-damaged patients, nine hospitalized neurological pa-

tients without brain damage, and seven neurologically normal non-hospitalized individuals. The groups were similar in intellectual level, socio-economic background, and in the absence of gross psychiatric symptoms.

There was clear evidence of a serious general impairment in successive discrimination ability in all but one of the brain-damaged group. The difference in total error scores on the rhythmic discrimination between the brain-damaged group and the 16 controls was highly significant; indeed there was virtually no overlap between the groups. The general impairment was found to be related to severity of brain damage and to intellectual level.

The errors of the brain-damaged group were analyzed to determine if there was any relation between the locus of cortical lesion and the specific discrimination tasks failed. No clearcut or important relation was found. It was discovered, however, that in patients with unilateral lesions of the parietal, temporal, and/or occipital lobes there was greater impairment of discrimination in sensory fields represented in the hemisphere of the lesions than in fields represented in the undamaged hemisphere. In patients with frontal or diffuse damage, on the other hand, there was no concentration of errors according to the laterality of the sensory fields stimulated.

Presumably, the processes necessary in successive discrimination are: (1) accurate perception of both stimuli, (2) accurate retention of the first stimulus, and (3) comparison or association of the traces of the two stimuli. It is suggested that brain damage may impair discriminative ability by interfering with the necessary chain of neural events at any one of several points, and that wherever these changes occur they always involve the slowing down of a fundamental afferent neural cycle.

114 pages. \$1.43. Mic 56-2353

#### AN INVESTIGATION OF THE CONSTRUCT VALIDITY OF SOME RORSCHACH VARIABLES

(Publication No. 17,384)

Robin James Clyde, Ph.D.  
The Ohio State University, 1956

To evaluate specific hypotheses as proposed within Klopfer's system of Rorschach interpretation, three judges drew up 60 statements about behavior in an attempt to relate the personality constructs hypothesized as underlying the Rorschach variables to behavior that could be observed or inferred by intelligent adolescents. A complete individual Rorschach test was administered to each of 34 subjects and, following this, the 60 items were administered to the subjects in the form of a check list. At this time the subjects attempted to identify each other in terms of the behavior patterns listed. The variable used from the check list was the number of times a given student was identified by his peers as exhibiting the behavior stated in a particular item, while the Rorschach variables consisted of the location scores and the determinants, which were used as scores or percentages, depending upon standard usage. To permit evaluation of the "additional" responses, they were counted as having one-half the value of "main" responses.

Pearson product-moment correlations were computed between the Rorschach variables and all items, and among all items. The null hypothesis was upheld for 10 of the 22 Rorschach variables tested. It was concluded that the investigation contributed to an understanding of the relationships between some of the Rorschach constructs and independently defined aspects of personality, and that it would seem to be a methodological contribution, since it demonstrated that relationships could be found between peer judgments and scorable Rorschach variables when the latter are obtained under standard conditions.

91 pages. \$1.50. Mic 56-2354

**A COMPARATIVE STUDY OF PARETICS,  
HEBEPHRENICS, AND PARANOID SCHIZOPHRENICS  
ON A BATTERY OF PSYCHOLOGICAL TESTS**

(Publication No. 16,589)

Evalyn G. Everett, Ph.D.  
New York University, 1956

Chairman: Dr. B. N. Kalinkowitz

**Problem**

Test results from matched triads of chronic paranoid schizophrenics, hebephrenics and paretics were evaluated to determine if significant group differences in test cues and patterns occurred and whether differences in the degree and kind of deterioration would be shown among the three groups. The diagnostic efficacy of the test instruments was also evaluated.

**Method**

The Wechsler-Bellevue, Rorschach, Bender-Gestalt and Human Figure Drawings were administered to the twenty triads. All sixty patients were of the white race and had been hospitalized two or more years. Eight females and twelve males were in each group. The mean age was approximately forty-nine years, the mean school grade completed was the ninth grade, and a majority of the patients in each group was in unskilled occupations. The significance of the differences found was evaluated by analysis of variance and Chi-square. The diagnostic efficacy of the test instruments and of the test battery was evaluated by comparing the number of correct blind diagnostic judgments made by four clinical psychologists on the individual tests and on the battery.

**Results**

On the Wechsler-Bellevue, the paranoid schizophrenics tested significantly higher than did the hebephrenics and paretics who functioned on an equivalent intellectual level. No relationship between diagnosis and the Hewson Ratios, the Wechsler Scatter Patterns or the Wechsler Deterioration Index was found.

On the Rorschach, the Piotrowski Organic Signs differentiated seventy-two per cent of the cases, the Hughes Signs diagnosed eighty-two per cent of the cases, and the presence of three or more of thirteen Chronic Schizophrenic Signs diagnosed seventy-two per cent of the cases correctly. More paranoid than paretics or hebephrenics were accurately screened by the lists of signs.

Seven schizophrenics gave M- responses, four showed edging and seven used neologisms on the Rorschach while no paretics showed these signs. Highly discriminating signs were the use of Variable Form Level by the schizophrenics and Perplexity by the paretics.

Six paretics and no schizophrenics showed micropsia and nine schizophrenics and no paretics used guide lines or dots in drawing the Bender-Gestalt figures. On both graphic tests, many more schizophrenics than paretics used a sketchy line quality. A reliable schizophrenic sign on the Human Figure Drawings was large figures seven inches tall or taller. None of Machover's diagnostic signs, except the schizophrenic sign of Item Emphasis, proved to be valid for these samples.

On the blind diagnostic judgments, the psychologists were most accurate on the test battery. The psychologists were least accurate on the Bender-Gestalt and most accurate on the Human Figure Drawings in their sortings of the individual tests. The paranoid were most frequently and the hebephrenics least frequently sorted accurately by the psychologists.

**Conclusions**

Chronic paranoid schizophrenics can be differentiated from paretics by the use of sign techniques (Piotrowski and Hughes Organic Signs) and by psychologists making blind diagnostic judgments from test protocols. Chronic hebephrenics and paretics can be differentiated but not as accurately as the paranoid and paretics.

Few test signs are pathognomonic for chronic schizophrenics or paretics but a number of test signs accurately differentiate the three groups at a high degree of statistical confidence.

More accurate diagnoses are achieved by the use of a test battery than by the use of a single test instrument.

Equated groups of chronic paranoid schizophrenics, hebephrenics and paretics show intellectual deterioration, the paranoid showing the least and the paretics and hebephrenics showing equivalent degrees of impairment in intellectual functioning. 571 pages. \$7.14. Mic 56-2355

**THE EFFECTS OF HANDLING AT VARIOUS AGE LEVELS ON EMOTIONALITY AND EXPLORATORY BEHAVIOR OF ADULT RATS**

(Publication No. 17,025)

Boris Gertz, Ph.D.  
The Florida State University, 1956

In recent years, human and animal studies have concentrated on the effect of infantile experience as an important factor in the later development of emotional stability. Many contradictory findings have been reported in the literature. The present experiment tested the general thesis that early experience affects later behavior and made a systematic study of the relationship between age and the effect of handling on emotional, exploratory, and learning behavior from a longitudinal approach.

Four groups of rats were divided into three experimental and one control groups. The latter received no specific handling while the three experimental groups received handling for 10 minutes a day for 21 days at various

ages: 25, 54, and 83 days. All groups were tested periodically on an open field test for two consecutive days for five minutes each day when the animals were 23, 52, 81, and 110 days old. Emotionality measures of exploratory behavior, frequency of defecation, and the number of boluses excreted were noted. When the animals were 112 days old they were presented with a dark-light discrimination problem in a simple water T-maze. The swimming time in seconds, correctness of response, and the number of trials to criterion were recorded.

Results indicated that there were no significant differences in emotionality between the groups when tested as adults. As a result of the periodic exposure to the open field test, there was a confounding effect of habituation to the field and age of testing. If one can accept the logical argument on the basis of independent data that repetitive experience with the open field produced a relatively small adaptation factor, then the age at which animals were exposed to stress situations gave differential results. As the animals became older they tended to become more active and less emotional. No significant interaction was found between age of receiving handling and age of testing. There were no significant differences between groups in the learning of the dark-light discrimination problem.

On the basis of these results it was concluded that there is no "critical age" at which handling is effective in terms of later behavior. Although handling does have an immediate and specific effect when given at an early age, it does not produce a permanent residue that manifests itself in the emotional, exploratory, and learning behavior of albino rats at maturity.

54 pages. \$1.50. Mic 56-2356

**PERSONALITY DYNAMICS AND LEARNING:  
A STUDY OF INDIVIDUAL DIFFERENCES  
IN LEARNING, RETENTION, TRANSFER OF  
TRAINING, AND SPEED OF REACTION  
AS FUNCTIONS OF PERSONALITY**

(Publication No. 16,590)

Stanley Irwin Gochman, Ph.D.  
New York University, 1956

There has been a tendency in psychology to divorce thought and intelligence from physical and emotional life.

The purpose of this research was to investigate the dynamics of individual differences in learning, retention, transfer, and speed of reaction in lifelike situations. It examined the hypothesis that performance in cognitive activity or in school subjects may be no more detached from the "personal equation" of the learner than any other expressions of his behavior.

120 college students participated as subjects in the study; 70 in a non-stress Affectivity group, and 50 in a Time Pressure or Stress group. They met certain criteria of intelligence, age, educational background, and socio-economic and motivational factors.

In an experiment on the effects of attitudes and preferences on learning, subjects in the Affectivity group ranked five curricular subjects (biology, chemistry, history, psychology, physics) in order of their attitudinal preference. Then, they were tested for their ability to learn, retain,

and transfer from representative passages in these subject areas. The Time Pressure group followed the same procedures. However, strict time limits were imposed upon learning. This created a situation of stress.

In another experiment on speed of learning, the initial learning speeds of the Affectivity group subjects were correlated with their learning, retention, and transfer scores. Also, the scores of the ten most "slow" and "fast" learners were compared for learning, retention, and transfer.

The findings and conclusions were that emotions interact continuously with intellectual processes. Neither the view that facts by themselves can be absorbed, nor the view that "people will learn better what they like better," was entirely correct. The answer lies between both extremes. Learning and retention are selective processes. The personal equation is always present, but intrudes less in a non-stress situation. However, in a stress situation, the effects become highly significant. Therefore, the kind of behavior response evoked by any given situation depends upon the emotional context of the situation and the individual's perception of it. In any given situation, the ability to utilize reason and rational control appears to grow in proportion to the degree to which stress is absent. In a non-stress situation, the individual is able to mobilize his resources and deal more effectively with the world on the basis of reason.

Though findings for transfer are less clear-cut, the role of the personal equation may be even greater, and may depend upon emotional context.

In contrast to the generally accepted view, speed of learning is not correlated with learning, retention, and transfer. "Fast" learners are not superior to "slow" learners. Speeds of reaction and learning differ considerably for individuals of the same intelligence level. They appear to be psycho-physiological functions of the individual.

Implications for psychology and life were presented. A general dynamic theory of learning was postulated: only that which is either of significance or value to a living organism is learned. A theory regarding stress was postulated: stress or anxiety, whether originating from a situation without or from psychological disturbance within, has similar effects. It prevents mobilization of a rational and controlled response. Instead, the individual tends to stick to "what he knows best."

Implications for changing behavior, learning, education, motivation, and psychotherapy were noted. Education may deal with the whole person by both transmitting knowledge and by meeting the individual's needs for creative life-adjustment.

With understanding of human dynamics, it appears possible for mankind to eventually solve its problems and deal more effectively with the world on the basis of reason.

178 pages. \$2.23. Mic 56-2357

**THE CONTRIBUTION OF CERTAIN PERSONALITY CHARACTERISTICS OF MALE PARAPLEGICS TO THE DEGREE OF IMPROVEMENT IN REHABILITATION**

(Publication No. 16,591)

Harry Goldsmith, Ph.D.  
New York University, 1955

The research was devised to determine the contribution of certain personality characteristics of male paraplegics to the degree of improvement in rehabilitation. The research population comprised thirty male paraplegics. No patient had a previous history of psychotherapeutic treatment or rehabilitation training. They were able to read, write, and communicate verbally in English. Each patient was put on a rehabilitation program which included routine medical care, physical therapy, activities of daily living, social worker contact, and visits with the psychological counselor.

It was hypothesized that the Much Improved rehabilitation cases are characterized by ability to express aggression, strong internalized superego without unsatisfied needs for self-punishment, and active efforts to integrate the disability into their concept of self. It was further hypothesized that the Little Improved rehabilitation cases are characterized by preoccupation with their own bodies and bodily complaints, dependency needs, difficulties in interpersonal relationships, feelings of inadequacy, and unsatisfied needs for punishment.

All patients were subjected to the Rorschach Test, Sentence Completion Test, and Diagnostic Interview. The Rorschach evaluated the patient's basic personality organization, while the Sentence Completion Test and Diagnostic Interview elicited attitudes about the self, the relation of the self to other people, and attitudes toward the disability. The clinical data obtained by means of the above procedures were analyzed with respect to the presence or absence of eleven personality characteristics. In addition to being rated by the researcher on those characteristics, each patient was described in an integrative summary so as to obtain a more complete picture in each case.

After three and a half months rehabilitation treatment, each subject received independent ratings by a physician and a physical therapist as to progress in physical rehabilitation, and by a psychologist and a psychiatric social worker as to progress in psychological rehabilitation. As a result of these ratings, the research population was divided into a Much Improved and Little Improved group with the exception of three patients who were placed in neither group.

Patients in the Much Improved and Little Improved groups were compared on the eleven personality variables and integrative summaries. The variables are 1) Existing Aggressive Needs, 2) Expression of Aggression (Direction), 3) Capacity for Emotional Contact, 4) Anxiety Aroused by Interpersonal Contacts, 5) Dependency Needs, 6) Anxiety Over Sexual Matters, 7) Strength of Internalized Superego, 8) Body Preoccupation, 9) Upset Over Disability, 10) Acceptance of Disability, 11) Future Outlook.

Those differences which were found to be significant at the .05 level of confidence were incorporated into a Prognostic Index. The latter included personality characteristics and global configurations which contributed to satisfactory rehabilitation and vice versa.

Three clinical psychologists placed each patient in one of the two groups with the aid of the Prognostic Index and the raw clinical data. The agreement between the ratings of these psychologists and those of the rehabilitation team were significant at the .01 level of confidence. The following conclusions were made:

1. Personality structure is of vital importance in predicting feasibility for rehabilitation.
2. Active upset with a need to do something about the situation, strong aggressive feelings, and optimistic attitudes facilitate the rehabilitation process.
3. Internalized aggression, dependency, need for self-punishment, and pessimistic attitudes interfere with rehabilitation.
4. The Prognostic Index may be used for predicting rehabilitation success. 162 pages. \$2.03. Mic 56-2358

**THE EFFECTS OF SUCCESS AND FAILURE EXPERIENCES ON CHRONIC SCHIZOPHRENIC PATIENTS**

(Publication No. 16,760)

Irving N. Hahn, Ph.D.  
The University of Oklahoma, 1956

Supervisor: Dr. R. G. Cannicott

The purpose of this study was to determine whether success and failure experiences effect the behavior and, by inference, the personality adjustment of hospitalized chronic schizophrenic patients. Following the reported experimental findings of Voth, and Sherif and Harvey, it appeared that the autokinetic phenomenon presented a method for studying significant personality variables from an aspect of behavior and its change. The above mentioned authors' research, especially that of Voth, suggested that extensive autokinetic movement was associated with loss of personal stability, mental illness, particularly schizophrenic reactions, and with poor prognosis, poor remission records, and poor adjustment of mental patients to a hospital setting. On the other hand, limited or moderate movement was reported to be associated with personal stability and individuals of "normal" behavior, and also with good prognosis, good remission records, and mental patients making a good adjustment to a hospital setting. The autokinetic method was used to measure the effects of success and failure experiences upon the adjustment of chronic schizophrenic patients with the specific hypotheses that: (1) Success experiences will be followed by a decrease in the amount of autokinetic movement perceived, and (2) Failure experiences will be followed by an increase in the amount of autokinetic movement perceived.

In order to investigate the above hypotheses, a group of 30 chronic schizophrenic male patients and a group of 30

chronic schizophrenic female patients, each divided into three sub-groups composed of individuals who had been assigned randomly to receive one of three treatment conditions, were tested individually in the autokinetic situation before and after success, failure, and control treatments were administered. The autokinetic method used was essentially the same as that used by Voth. A check on whether those situations designed to produce experiences of success or failure were actually experienced as feelings of success and failure revealed a high positive relationship between the situation and the patient's report of his experience.

From the results obtained, and subsequent non-parametric statistical analyses, the previously stated hypotheses were accepted. The following conclusions appeared to be warranted concerning chronic schizophrenic patients, exclusive of the paranoid type: (1) Experiences of success decrease the amount of autokinetic movement perceived, reflecting a therapeutic effect upon their adjustment; (2) Experiences of failure increase the amount of autokinetic movement perceived, reflecting a detrimental effect upon their adjustment.

This study reaffirmed Voth's findings that chronic schizophrenic patients have extremely high and constant autokinetic movement indices. The results also supported in part the experimental and theoretical work of Sherif and Harvey relative to ego functioning, and led to practical suggestions for treatment of chronic schizophrenic patients.

65 pages. \$1.00. Mic 56-2359

#### FORMAL AND CONTENT FACTORS OF PROJECTIVE TESTS IN RELATION TO ACADEMIC ACHIEVEMENT

(Publication No. 16,311)

Jack Lit, Ph.D.  
Temple University, 1956

This study was concerned with an analysis of personality differences between dean's list students and probation students as revealed by the Rorschach test and the Rotter Incomplete Sentences Blank. A corollary to this was an attempt to determine whether an analysis of the formal scoring categories would be more discriminative than an analysis of the verbalized content.

The population for this study was limited to forty dean's list students and forty probation students taken from the undergraduate Teachers College and Liberal Arts College of Temple University. Only volunteer subjects were used. Individuals comprising the dean's list group were matched with individuals in the probation group with respect to age, sex, college and total raw score on the Ohio State Psychological Examination, Form 24.

The analysis of the data consisted of the computation of the means and standard deviations and chi square for the formal Rorschach scores and each of the following content areas: hostility, anxiety, depression, self depreciation, extensor movement, flexor movement and blocked movement.

The means, standard deviations and chi square were also computed for the total Rotter score and each of the following content areas: hostility, anxiety, depression, self

depreciation, passivity, blocking and insecurity.

Although the findings of this study were suggestive, the limitations of this study indicated that they be interpreted with caution for application beyond the sample studied.

Rorschach formal scoring. There were found to be no statistically significant differences between the dean's list and probation students for the male population in 26 of the 27 Rorschach factors studied.

The dean's list students gave significantly more S responses than the probation students, which might indicate an intellectual kind of stubbornness or intellectual aggression necessary for academic achievement.

All other formal scoring categories did not differentiate between the two groups.

No statistically significant differences between the dean's list and probation students for the female population was apparent in any of the 27 Rorschach factors studied. Rorschach content categories. Statistically significant differences were found between the dean's list and probation students for both male and female groups in three of the seven content categories studied.

The dean's list students of both the male and female populations had significantly more responses in which extensor movement was involved. This suggested that the dean's list students were more energetic and aggressive in their reactions to the environment and therefore were thought to be more assertive in their attack on intellectual material.

Both male and female probation groups had higher hostility scores than did the dean's list students. This implied that the probation students held attitudes of ill will, resentment, enmity and destruction. The directional tendency of this hostility was felt to be of major importance.

The male and female probation students produced significantly more responses based on flexor movement. It was suggested that this meant the characteristic attitudes of the probation students were predominantly those of passivity and submission. Since this appeared to be a lack of overt expression it was assumed that the hostility, previously reported, remained internalized and directed toward the self.

Rotter - Total scores. There were found to be no statistically significant differences between the dean's list students and probation students for either the male or female populations in regard to the total Rotter score.

Rotter content categories. Statistically significant differences were found between the dean's list and probation males in three of the seven variables studied. Significant differences were found between the dean's list and probation females in five of the seven variables studied.

Male and female probation students produced more hostility responses than did a like population of dean's list students. Apparently the probation groups harbored feelings and attitudes of an aggressive destructive nature which could have been a result of feelings of frustration.

Again, the probation males and females scored significantly higher on passivity scores, suggesting that their concept of role was predominantly that of submission and passivity. It also suggested that the direction of expression for the hostility would be toward the self.

Probation males and females used more verbalizations of a self depreciatory nature. They tended to react to their academic failures with self blame, self recrimination and guilt. There was a possibility that these verbalizations were in the nature of punishment for guilt in lack of achievement.

There were significantly more responses reflecting anxiety in the probation females only. The precise meaning of the anxiety cannot be stated. However, it was felt that the anxiety could have been a result of the inability to handle the hostility adequately.

Finally, the probation females appeared to have a stronger depressive trend than did any of the other groups. The tentative suggestion would fall in line with findings above -- that the depressive trend was the result of the felt feelings of academic inadequacy.

125 pages. \$1.56. Mic 56-2360

#### AN ANALYSIS OF RELATIONSHIPS BETWEEN TEST BEHAVIOR AND TYPES OF DEFENSE

(Publication No. 16,923)

Eugene L. Mariani, Ph.D.  
University of Houston, 1956

The purpose of this study was to test some of Schafer's hypotheses relating to some of the constructs underlying the Rorschach protocol. Schafer attempted to interpret Rorschach data on three levels of analysis: formal scoring, test attitudes and behaviors, and content analysis. The present study compares Schafer's three levels of interpretation with psychiatrically diagnosed populations of Hysterical Characters, Paranoid Characters, and Obsessive Characters. A total of 75 subjects was used.

Three scales were formulated from Schafer's material to test his suggested levels of Rorschach interpretation. The scales were submitted to an exploratory pilot study in order to detect those items which could significantly differentiate between the nosological groups. The next phase of the study was to cross-validate those significant items on a new population of Rorschach records. All the results were tested by a non-parametric Median Test for statistical significance.

The scale for formal scoring yielded results in favor of the Obsessive Character only. Moreover, it was observed that a statistically significant relationship exists between the number of responses in a Rorschach record and the number of significant determinants yielded by the high-response Rorschach records. Obsessive Characters produce a greater variety of determinants as well as a greater number of responses. These data support the contention that Rorschach determinants must be used with a great deal of caution in predicting character structure.

A number of significant relationships were established between the scale on test attitudes and behaviors and prediction of nosology. The items, constructed from Schafer's discussion on defenses, used in the study were not only successful in describing their particular nosology, but further, were successful in discriminating between all nosological groups. The data support the usefulness of observation of the attitudes and behaviors as a valid source of material from which significant interpretations can be made about the subject being tested.

The thematic content analysis did not provide a valid discrimination among the three nosological categories. It was noted that content analysis might be better utilized in learning more about the basic personality problems for any given individual, rather than as a criterion for differentiating among character structures.

From the data in this study it is felt that a number of possibilities are revealed for further exploration of test attitudes and behaviors as an essential part in Rorschach analysis.

113 pages. \$1.50. Mic 56-2361

#### A COMPARISON OF A PROJECTIVE TEST BATTERY WITH ITS COMPONENT TESTS

(Publication No. 16,924)

Rose Ramsay Mariani, Ph.D.  
University of Houston, 1956

The purpose of this study was to investigate the relationship of a battery of projective tests with its component tests to learn whether or not the battery was a more accurate clinical tool in the prediction of certain nosological disorders. The psychometric techniques evaluated in this study were the Rorschach Test, the Wechsler-Bellevue Scale, Form I, and a test battery comprised of these two tests and a word association test.

The population of projective tests consisted of the records of 60 patients from the John Sealy Hospital in Galveston, Texas. The validation criteria were three independent diagnoses of psychiatrists. The nosological categories investigated in this study were Depression, Hysteria, Obsessive-Compulsive, Organic Brain Pathology, Psychopathic Personality, and Schizophrenia.

Two aspects of examiner-variance were investigated. The first of these was the training and experience level of the judges. Of the 14 judges in this study, three were graduate students in clinical psychology with didactic training only, four judges were first year interns, three were second year interns, and four judges were experts with a minimum of two years supervisory experience. An hypothesis was advanced that as a judge had more experience with projective tests, his accuracy of prediction would improve.

The other aspect of examiner-variance investigated was the frame of reference from which the judge predicted the nosological category. For the purpose of this investigation, those judges whose experience and/or training was at the University of Texas Medical Branch at Galveston, Texas, were compared with judges of equivalent experience from other localities.

Further, the nosological groups were compared with each other to determine the relative difficulties these categories presented to the judges.

From this investigation, certain conclusions were made. In the comparison of the battery with the component tests, it was learned that the battery excelled significantly over the Rorschach Test in predicting psychiatric diagnosis. Although the test battery was better than the Wechsler-Bellevue Scale, this difference was not found to be significant.

With respect to the training-experience aspect of examiner variance, it was found that the second-year intern group differed significantly both with the didactic-trained graduate student group and with the first-year intern group. These differences held up not only for the accuracy with specific tests, but also in the prediction of the specific nosological categories. The first-year intern group in many instances excelled the graduate student group. How-

ever, the expert group was not consistent with this sort of linear progression up the scale from least to most trained.

Of the six nosological categories compared for accuracy of prediction by all judges, the most difficult were found to be Depression and Hysteria. The next most difficult diagnosis was Schizophrenia, followed by Organic Brain Pathology. The records of Psychopathic Personality and Obsessive-Compulsive subjects were most accurately chosen by the judges.

Finally, the frame of reference of the judge was found to contribute significantly to his ability to discriminate and predict the nosological categories used. The only nosological categories where no differences existed between the frame-of-reference groups were those which appeared to be readily identified by all judges.

88 pages. \$1.50. Mic 56-2362

#### CRITERIA FOR DIAGNOSIS AND PREDICTION IN A REMEDIAL READING PROGRAM

(Publication No. 16,925)

Carl E. Morgan, Ph.D.  
University of Houston, 1956

The purpose of this study was to determine what factors were present that would, (a) differentiate between children having reading difficulty and those without reading difficulty; and (b) to discover what factors would differentiate between those children succeeding in a remedial reading program and those failing.

Three groups of subjects, 20 normals, 22 successes, and 22 failures, were compared on a total of 86 variables. These variables were divided into classifications of vital statistics, medical data, and psychological test data.

Chi-square tests of significance were used to determine differences between each pair of groups. Medians and ranges of scores were utilized to give an idea of the nature of the distribution for each of the variables measured.

Four outside criteria were compared against the original criterion of grades which was used for construction of the success and failure groups.

The following results were found when the normal and remedial center groups were compared.

1. There were no statistically significant differences found between the success and failure groups when compared with each other.

2. The success group tended to have more subjects below the median age level than did the failure group. This difference approached significance, being between the .10 and .05 levels of confidence.

3. There were six vital statistics factors which proved to be significantly different between the normal and remedial center groups. (a) The normal group tended to have parents with college background. This was significant at the .001 level of confidence. (b) The normal group tended to live with both parents, as opposed to living with neither or one parent. This was significant at the .05 level of confidence. (c) The normal group tended to be first-born children rather than last-born children. This was significant at the .05 level of confidence. (d) The normal group tended to be born of mothers under 29 years of age. This was significant at the .01 level of confidence. (e) The fathers of the normal group tended to be under 35 years of age.

This was significant at the .01 level of confidence. (f) The normal group tended to have vision considered abnormal more often than the remedial center groups. This was significant at the .05 level of confidence.

4. There were 23 test factors which proved to be significantly different between the normal and remedial center groups, the normal being superior. Because of the large number involved, these will be listed in terms of the level of confidence at which the difference was significant. (a) At the .01 level of confidence, the following test factors proved to be significantly different: WISC Verbal Scale, number of cases above the median for all three WISC scales, Reading Comprehension, Informal Word Recognition, Van Wagenen Word Discrimination, Strauss Rhythmic Tone Pattern, Strauss Tactual-Motor Test, Monroe Auditory Discrimination, Monroe Sound Blending, Tachistoscopic Examination, and Visual Attention Span for Letters. (b) Those test factors significantly different at the .05 level of confidence were WISC, Full Scale; WISC, Performance Scale; Reading Vocabulary; Spelling; Gray Oral Check Test; Monroe Word Discrimination; Monroe Iota Word Test; Gates Visual-Visual, Word-Like Figure; Gates Auditory-Visual, Word-Like Figure; Strauss Visual Perception; and Auditory Attention Span for Related Syllables.

5. There were two variables within the medical data which differentiated significantly. (a) There were fewer abnormal EEGs for the normal group than for the failure group, the difference being significant at the .05 level of confidence. (b) There were unusual illnesses associated with abnormal EEGs for all groups, the significance of Chi-square being at the .05 level of confidence.

6. There were three test factors approaching the .05 level of confidence when comparing the normal with the remedial center groups. They were Binet Digits Forward, Strauss Picture Word Test, and SRA Reasoning Test - Figure Grouping.

The percentage of accuracy for predicting whether the children from the remedial center groups would fall into the success or failure category was 59% for the raters of the remedial center staff. The percentage of accuracy was also 59% for the parents of children still in the remedial center. For alumni parents, the percentage of accuracy was 62%. All groups of raters were more accurate in predicting successes than in predicting failures. A fourth group of raters, teachers in public and parochial schools, achieved an accuracy of 58%, but the extremely small N cast considerable doubt upon the reliability of the predictions.

Possible explanations for differences found among the groups were given and three speculative constellations of causal factors in relation to the differences between success and failure groups when compared with the normal group, were presented. These were: (a) a causal factor of emotional immaturity on the part of the parents of the failure group, (b) a factor of more interested persons in the home environment of the success group, and (c) a possible factor of brain damage related with the failure group. The last speculative statement appears to be the most substantial one in terms of the data presented.

The conclusions drawn are the following:

1. There are differences which are statistically significant, between a normal group and a remedial center group, other than factors of reading ability. This statement must be qualified by the knowledge that the normal group was a volunteer group and the operation of this vari-

able was not known. It must be further qualified by the difference found on intelligence between the normal and remedial center groups which, however, would not account for the differences in performance found between the remedial center groups, after the remedial training program, since their intelligence scores were very similar.

2. There are differences estimated between success and failure groups when these groups are compared with a normal group.

3. Some of the test factors differentiate to such a small degree that the value of their inclusion in a diagnostic program is questionable in terms of economy of time and energy.

4. There are various ways in which significantly different factors can be patterned which are suggestive of possible causal relationships for children who fail in the remedial reading program. Which of these patterns might have the most merit and which of these patterns existed as causal factors was not determined in this study.

5. The findings of this study would seem to indicate that there are factors which operate in such a way as to cause some children, termed successes, to perform differently at the conclusion of a remedial reading program from other children, termed failures.

Following are some suggestions for further research: (a) a study utilizing known brain injured children compared with known non-brain injured children and employing some of the same types of measures used in the present study; (b) studies investigating the other two speculative explanations for the differences found between the success and failure groups; and (c) a study investigating the reasons for inaccurate prediction of raters on children in a treatment program, the object in view being to increase accuracy of prediction. 94 pages. \$1.50. Mic 56-2363

relationships among (a) the three perceptual tests, (b) the three verbal tests, and (c) all possible pairs of tests. Finally, individual differences in variation were compared from one category of movement to another. Two additional hypotheses were examined in this connection:

a. That the degree of variation shown by the subject in one category of movement is consistent with that shown in other categories;

b. That all or a significant majority of subjects are consistent in some one or more categories of movement.

It was concluded from the results that:

a. The conception of movement in all three common categories - M, FM, and m - might well be related to deep-rooted, stable characteristics in some but not for the great majority of the subjects.

b. The relationship appeared more likely to be found in tests of the perceptual than of the verbal type, but even on this basis it did not appear likely for all or even a majority of subjects.

c. If the conception of movement bears any significant relationship to psychological processes for more than a minority of subjects, then the relationship is largely specific to certain tests or types of tests and that performance is not generally predictive from one type of test to another for any individual.

d. Individual differences in variation were not of a generally consistent character from one category of movement to another so as to suggest that they might represent something intrinsically stable in the individual except where the subject is generally consistent in level of movement production.

e. There was no indication in intercategory comparisons that stable individual differences might be generally defined on the basis of selectively consistent tendencies favoring some one or more of the several categories of movement.

The results of the study were considered in relation to others reported in the literature and were cautiously interpreted to suggest that:

a. The conception of movement might well be relevant for some individuals or groups but not for others, and that future research might well be directed toward identifying these classes of subjects and providing a basis for discretionary interpretation in clinical practice.

b. Tests of the perceptual type appeared to offer greater promise than those of the verbal type for discriminating substantial numbers of such subjects.

c. The utility of individual differences in variation for diagnostic classification - if warranted, at all - is limited to specific areas of performance and cannot be assumed without establishing the stability of the observed differences.

d. The validity of certain basic assumptions underlying the projective techniques was questioned and their revision suggested. 109 pages. \$1.50. Mic 56-2364

#### CONSISTENCY OF PROJECTIVE MOVEMENT RESPONSES

(Publication No. 17,072)

Joseph Frank Okarski, Ph.D.  
Columbia University, 1956

The purpose of the experiment was to examine the assumption that the movement responses as observed in projective tests represents something basically stable in the individual's personality and behavior.

It was hypothesized that, if the assumption is tenable, then the individual's comparative level of movement production is consistent over a range of different test situations.

The hypothesis was examined on the basis of the percent human (M), animal (FM), inanimate (m), and sum movement (SM) scores obtained by 82 ostensibly normal male military recruits, 18 to 25 years old, on a battery of three perceptual and three verbal tests: the Rorschach, Behn-Rorschach, Levy Movement Cards, two new Sentence Construction tests, and a modification of Severn's heteronym technique. The data in each category of movement were first examined for evidence of significant intertest agreement on whether the subject scored consistently above or below the median on the full battery of tests. Supplementary analyses were made to detect trends and

**AN INVESTIGATION OF PARENT-CHILD  
RELATIONSHIPS, IN BROKEN HOMES  
AND THEIR RELATIONSHIP TO  
SCHOOL BEHAVIOR**

(Publication No. 16,603)

Bernard Hollander Rush, Ph.D.  
New York University, 1956

The purpose of the investigation was to determine the relationships among the mothers' expressed attitudes towards sons (as measured by the University of Southern California Parent Attitude Survey), the sons' attitudes towards mothers (expressed attitude - as measured by Needelman's Child-Parent Relationship Scale; on a deeper level - as measured by the TAT), and the sons' behavior in school (as measured by the Haggerty-Olson-Wickman Behavior Rating Scales).

A few empirical studies appear to support clinical observation of certain aspects of the parent-child relationship. Namely, the rejecting or ignoring parent will have the aggressive, rebellious child; the dominating parent will have a submissive child; and the possessive parent will have a withdrawn child.

This study attempted to determine the validity of these observations when applied to a low socio-economic, broken home group of Negro subjects.

Thirty-five male Negro pupils were serially chosen from among the 7th, 8th and 9th grades. In all cases the father was absent from the home for at least five years. The mean age of the boys was 13.91 years. The mean absence of the father from the home was 8.51 years.

A minimum I.Q. of 80 for the boys was one delimitation, another was the fact that the mothers had to have completed a minimum of six years of schooling.

Rank correlational techniques were applied to determine the relationships between attitudes and behavior as measured by the test instruments noted. The TAT stories were ranked independently by three psychologists. They were asked to determine the son's attitudes, on a deeper level, toward his mother and to rank the sons, in accordance with the criteria given them, for submission, aggression and withdrawal. The Spearman-Brown prophecy formula was used to estimate the increased reliability which might be expected if six judges were used.

The following rank order correlations were significant at the one per cent level of confidence:

1. Those mothers who were more rejecting have sons who are more overtly aggressive.
2. Those mothers who are more dominating have sons who are more submissive on a deeper level.
3. Those mothers who are more rejecting have sons who are more hostile on a deeper level.
4. Those mothers who are more possessive have sons who are more withdrawn on a deeper level.
5. Those mothers who are more ambivalent have sons who manifest more ambivalent attitudes on a deeper level.
6. Sons whose mothers are more possessive see them as being more possessive.
7. Sons whose mothers are more dominant see them as being more dominant.
8. Sons whose mothers are more ignoring see them as being more ignoring.
9. Sons who are greater behavior problems in school are more aggressive, on a deeper level, and have mothers who are more rejecting.

The following rank order correlations were significant at the five per cent level of confidence:

1. Those mothers who are more ambivalent have sons who manifest sporadic behavior problems.
2. Those mothers who are more ambivalent have sons who are more aggressive on a deeper level.
3. Sons who see their mothers as more dominant have more submissive attitudes, on a deeper level, and are more overtly compliant in school.

In terms of this study, the sons who are listed as having more submissive feelings toward mothers, rather than the more withdrawn sons, are ranked as being the more compliant and unaggressive. In addition, there is a positive significant correlation between the mothers' expressed attitudes and the sons' expression of their mothers' attitudes toward them. Neither of these factors had been established in previous studies.

Generally, the results of this study closely approximated those using different techniques and population. Thus, this study tends to support the concept that environmental factors, such as minority groups or different socio-economic levels do not change the interaction between parent and child.

209 pages. \$2.61. Mic 56-2365

**OLD AGE AND DEATH ATTITUDES:  
A COMPARATIVE ANALYSIS AND EVALUATION  
OF RESPONSES BY A GROUP OF AMBULATORY  
WHITE FEMALE PERSONS SIXTY-FIVE YEARS  
AND OLDER LIVING UNDER VARYING  
CONDITIONS OF INSTITUTIONAL SUPERVISION**

(Publication No. 16,604)

Samuel D. Shrut, Ph.D.  
New York University, 1956

Chairman: Professor Edward L. Kemp

The purpose of this study was to investigate the attitude toward death in aged, ambulatory, currently unmarried, white, female persons living under two kinds of institutional residency. An attempt was also made to relate the attitude toward death with self-appraisal of health, adjustment in the institutional setting, and with claimed participation in activities for the two research groups.

The growing literature in gerontology disclosed little more than a tangential relationship to the present study. While varying concepts of death presented themselves, this study was not concerned with the various symbolic meanings of death, but gave primary consideration to the range in attitudes from philosophic acceptance or welcome anticipation to marked apprehension of death as the terminal event in the life of the organism.

Subjects of the study were thirty persons residing in the apartment dwellings of the Home for Aged and Infirm Hebrews of New York, and a similar population from the institution's central residential facility. In each case the research population consisted of volunteers, obtained by means of random selection from a stratified sample after consultation with the Medical and Social Service Departments of the Home.

The experimental design of the study consisted of comparing the two groups by means of a psychological test

battery of instruments which, except for the Thematic Apperception Test, were especially devised, along with their respective rating scales, by this investigator. The instruments, in order of their standardized presentation, were as follows:

Questionnaire on Self-Appraisal of Health  
 Questionnaire for Adjustment in the Home  
 Sentence-Completion Test  
 Thematic Apperception Test  
 Questionnaire on Claimed Participation in Activities

Attitude toward death was studied by means of clinical impressions of responses from the Sentence-Completion Test and Thematic Apperception Test, along with judgments made from the other protocols as well. The other questionnaires guided the interviews towards eliciting information in the areas suggested by the titles of the respective questionnaires.

Various categories of judges (a physician, psychologists, social workers) rated protocols and made pertinent judgments of subjects.

In addition to qualitative treatment, quantitative treatment of the results utilized Fisher's "t"-test to evaluate mean differences of rated responses between the two groups. The chi-test of significance was employed to show that the findings, in terms of significance, were not determined by chance. The Pearson product-moment correlation technique served to determine inter-test correlations and reliability of judges.

The findings suggested that subjects residing in the environment more closely approximating their pre-institutional home or domestic environment (Apartment Residence) revealed lesser fear of death, with the consequent implication that subjects of Apartment Residence enjoy better mental health and are more concerned with planning for continued living than appears to hold for subjects of the traditional institutional residence (Central House). The additional hypotheses concerning relationships between attitude towards death and adjustment in the institutional setting, and between attitude towards death and claimed participation in activities, were not found to be statistically significant.

Compensatory mechanisms were found to operate more prominently with Central House subjects, revealed for the health area by marked self-overestimation of their good state of health. Behaviorally, respondents from Apartment Residence were more socially alert, less suspicious, and generally more cooperative to the study.

Various research recommendations of a contiguous and ancillary nature present themselves for further investigation in the field of gerontology. There is a deeply-felt need for incisive and fruitful contributions to general knowledge about aged persons, and more specifically, with regard to the effects of institutional residency, with its implications for planning with, and for, the aged person.

204 pages. \$2.55. Mic 56-2366

## PSYCHOLOGY, EXPERIMENTAL

### COMPARISONS OF HOMOGENEOUS GANZFIELDS WITH GANZFIELDS CONTAINING SIMPLE FIGURES

(Publication No. 17,425)

Walter Cohen, Ph.D.  
 University of Michigan, 1956

The purpose of this study is to determine the phenomenal characteristics of the Ganzfeld under conditions of homogeneity and when a small differentiated area is present. The homogeneous Ganzfeld may be considered the simplest level of visual stimulation and information concerning its phenomenal characteristics may contribute to the evaluation of the effects of stimulus gradients. Those phenomenal aspects primarily dealt with are color, figure distinctness, mode of appearance, and phenomenal space.

The following three questions guided the design of the experiment. In what manner is the appearance of the homogeneous Ganzfeld dependent upon intensity and wavelength? How does the appearance of the inhomogeneous Ganzfeld differ from that of the homogeneous Ganzfeld? How are these differences in appearance related to the stimulus distributions?

Since none of the previous investigations provided a method that could be used in the present study, it was necessary to develop a new method. Two Ulbricht type spheres were joined and appropriate illumination produced either a uniform Ganzfeld or a Ganzfeld containing a small differentiated area. Sixteen observers, using monocular vision, gave phenomenological descriptions as well as paired comparisons of the Ganzfelds.

The most characteristic description of the homogeneous Ganzfeld was that of close, impenetrable fog. The experience was a unique one, and most observers had difficulty describing the field in terms usually associated with visual phenomena. In some instances, temporary cessation of visual experience was reported. Variations in intensity of illumination did not consistently alter the appearance of the field although there was some indication that fields of greater intensity appeared denser and closer. Dominant long wavelength illumination also produced closer and denser fogs than dominant short wavelength light. The uniform chromatic Ganzfeld was reported as either poorly saturated or neutral in appearance.

The presence of a differentiated area in the Ganzfeld resulted in changes in its phenomenal characteristics. When the differentiation resulted from chromatic gradients alone, a distant, indefinite figure was reported, which was highly saturated. Modifications in the appearance of the fog were slight. Those situations involving dominant short wavelength light seemed more indefinite than those involving dominant long wavelength light. The addition of an intensity gradient to the chromatic gradient increased definiteness of the figure-ground segregation but reduced the saturation of the figure.

The effect of moderate intensity differences alone was to produce a relatively definite separation of figure and ground. Saturation was as poor as in the homogeneous Ganzfeld. The density of fog was considerably reduced. Increased intensity difference further separated figure and ground. The fog disappeared. The figure was seen as closer than the ground. Their modes of appearance dif-

ferred and a distinct boundary separated them.

The phenomenal characteristics of the Ganzfeld do not appear to be independently determined. Any change in stimulation that modifies one aspect of experience produces concomitant changes in the other phenomenal characteristics of the Ganzfeld. The distribution of stimulation rather than the nature of the local stimulus seems to determine what is experienced. Thus, the results of the present investigation appear to be in harmony with a configurational approach rather than the traditional "constancy hypothesis."

117 pages. \$1.50. Mic 56-2367

#### THE EFFECTS OF VARIED PRE-EXPERIMENTAL ENVIRONMENTS ON OPEN FIELD BEHAVIOR AND ELEVATED MAZE LEARNING IN THE RAT

(Publication No. 17,170)

Herbert C. Hayward, Ph.D.  
The University of Tennessee, 1956

The purpose of this experiment was to determine the effects of varied pre-experimental environments upon the free field behavior and elevated maze learning in the rat.

Three major environmental conditions were employed: animal room, reduced stimulation room, and late treatment room. The animal room condition was the animal laboratory at the University of Tennessee Psychology Department. The reduced stimulation room was of practically no illumination, lowered noise level, and cages were individually isolated by cardboard shields. The late treatment room was a combination of the above conditions.

Animals in the reduced stimulation environment were placed there at weaning; the late treatment groups were transferred from the animal room to the reduced stimulation room at approximately seventy days of age.

Under the above conditions the animals were divided into colony cage groups of four Ss each and isolate cages.

Sixty-seven animals were used, and including the maze control group who lived in the animal room and received no free field trials. All Ss were originally of the Wistar strain and were obtained from the Home Economics Colony of the University of Tennessee and the Red Bank Laboratories, New Jersey.

Field trials were started when Ss were approximately 100 days of age. Eleven five-minute daily trials were followed by eleven days of no trials, and then eight more to make a total of nineteen field trials. Variables measured were number of grid entries, rears, head bobbings, grooms, defecation, and number of seconds spent inert.

Following a three day break, elevated maze trials were started. Subjects were given twenty spaces trials or one hundred minutes of maze time, whichever occurred first.

At the end of experimentation all Ss were weighed.

Results for the free field showed that all groups responded with greater frequency on early trials for all variables except inertness; following the break in the trial sequence there was spontaneous recovery of early trial behavior. Rank order from highest to lowest responding was late treatment, reduced stimulation, and animal room groups.

Rank order for learning as measured by time scores and errorless trials on the elevated maze was animal

room, reduced stimulation, late treatment, and maze control groups. Except for the comparison of late treatment with maze control groups the findings were significant.

Analysis of data for the array of mean weights of major groups was significant in the rank order of descending weights of maze control, late treatment, reduced stimulation, and animal room groups.

It was concluded that the pre-experimental conditions did increase the diffuse gross body behavior in the open field for late treatment and reduced stimulation groups as compared to controls and in the above order. It was further concluded that these conditions interacted with open field trials and handling of animals produce very significant differences in elevated maze performance.

261 pages. \$3.40. Mic 56-2368

#### THE EFFECTS OF ELECTROCONVULSIVE THERAPY ON RETROACTIVE INHIBITION IN SCHIZOPHRENIC AND DEPRESSIVE PATIENTS

(Publication No. 16,595)

Hyman Korin, Ph.D.  
New York University, 1955

The problem was to determine the effects of electroconvulsive therapy on retroactive inhibition in schizophrenic and depressive patients. To study this problem, retroactive changes were investigated during the course of therapy and after treatment was terminated. Considerable attention was also focused on the effects of electroshock on the original learning, interpolated learning and recall and relearning variables of the retroactive paradigm. In addition an analysis was made of the relationship between the individual patient response during treatment and therapeutic outcome. The hypotheses were that (1) a significant increase in retroactive effect occurs during electroshock and (2) that there is a significant relation between individual pattern of response and therapeutic outcome.

The subjects were 40 electroconvulsive therapy patients with schizophrenia or depressive psychosis and 21 control patients who were a representative sample of the electroshock group with respect to age, education, diagnosis and previous electroshock treatment. All the control patients were designated as possible electroshock candidates.

Methodologically, the testing procedure involved a test of the ability of the patients to recall and relearn an original learning of lists of eight three letter common words, at weekly intervals under two conditions: (1) immediately after an interpolated learning of a list of nonsense syllables; (2) after a minute rest period during which a copy of "Life" magazine was read. The interpolated learning and magazine reading were presented on separate non-electroshock days after successive alternate treatments. The lists of words and syllables were arranged according to the conventional, experimental rules respecting position and frequency of occurrence of vowels and consonants. All the lists were presented at random on flash cards operated manually by the examiner. The items learned and retained were studied by the anticipation method.

Intra-group and inter-group results indicated that the calculated percent retroactive inhibition as determined by

formula increased consistently during treatment and that this increase was reversible after the therapy was terminated. However, the increased effects were not always significant particularly for the relearning condition. Thus the hypothesis that significant retroactive effects occur during electroshock was supported, although within specified limitations.

An analysis of the learning, recall and relearning variables of the retroactive paradigm indicated that recall following interpolation was the most sensitive variable to decrement. Significant differences were obtained at all intervals of treatment for both intra and inter group comparisons. For the remaining variables, the results were not significant either at the initial 1-3 or the final 10-12 treatments. However, decrements found for all the foregoing conditions were reversible within one week post therapy. Maximum decrement was evident in the 4-6 and 7-9 interval and during the 10-12 interval there was a decrease in decrement which was attributed to the reduction in treatment frequency for many patients.

Intra-serial effects during original and interpolated learning increased during treatment. Curves plotted show that the greatest decrement occurred in the center of the series of 8 words or syllables, although the general shape of the curves remained unchanged.

An analysis of individual patterns of response for recall following interpolation and original learning during treatment indicated that the majority of patients showed a decrease in scores during electroshock as compared to their pre-treatment performance. No significant difference in decrement between improved and unimproved groups was found when a chi square test was applied. The interpretation was that memory impairment is not related to improvement. However, the persistence of minimal decrement in 5 patients treated with approximately 20 treatments seemed to be associated with no-improvement.

Only a few patients showed a pattern of decrement post therapy. These patients were for the most part unimproved.

148 pages. \$1.85. Mic 56-2369

#### THE EFFECT OF STIMULUS-RESPONSE ORDER ON MEDIATED ASSOCIATION

(Publication No. 17,077)

Howard Benedict Ranken, Ph.D.  
Columbia University, 1956

An associative connection between two items, A and C, occurring in the absence of any previous direct association between A and C and resulting from their common association with a third item, B, is said to be a "mediated association." Previous experiments have demonstrated the existence of mediated association, but have led to conflicting results on two further points: first, does unconscious mediated association occur (in which the subject does not verbalize the mediating relationship)?; second, does mediated association occur with non-meaningful materials? The present experiment was directed in part at securing further data on these questions.

S-R theorists have interpreted mediated association, as well as mediated generalization and discrimination, in terms of the occurrence of covert responses and response-

produced stimuli. On this theory, the stimulus-response order in mediated association should affect the amount of mediation obtained. Mediating associations of the form A-B, B-C (the "S-R" order) should produce more facilitation of an A-C connection than mediating associations of the form A-B, C-B (the "S-S" order), since in the S-R order the links of a chain A-B-C connecting A and C are present, while in the S-S order the B-C link is reversed. The third purpose of the present experiment was to investigate the effects of this order variable.

Each subject in the experiment learned three lists of nonsense syllable paired associates. The syllable pairs of the third list fell into four categories or experimental conditions, differentiated by the nature of the corresponding mediated associations set up in the first two lists. In two categories, the S-R order was used. Under one of these conditions, the resulting mediated associations were between items which were then paired in the A-C list, and for which learning should therefore be facilitated. In the other S-R category, the mediated associations were between items not paired in the A-C list, and would therefore interfere with learning this last list. In the two remaining categories, the S-S order was used. In one, any mediated association would produce a facilitating effect; in the other, an interfering effect. The measure of the mediating effect with each order was the difference between the facilitating and interfering conditions for that order, in mean number of errors occurring during the learning of the A-C list.

After the lists were learned, subjects were questioned as to whether they had noticed the mediating relationships while learning the lists. Subjects who verbalized the mediating relationship for one or more A-C pairs were excluded from the main analysis, which thus involved only subjects for whom any mediating effect was "unconscious" in the sense that the mediating relationship was not verbalized.

Analysis of variance indicated significant differences among the four experimental conditions. The differences between facilitating and interfering conditions within each order fell short of significance, but when the two facilitating conditions were combined and compared with the combined interfering conditions, in an overall test of the mediation effect, the resulting difference was significant at the 5% level.

Comparison of the mediation effect for the S-R order with that for the S-S order showed that the effect was larger with the S-S order, but not significantly so. On the S-R hypothesis, the effect should be larger with the S-R order.

The following conclusions were drawn: 1) Mediated association does occur with non-meaningful verbal materials; 2) Mediated association does not depend on the verbalization of the mediating relationship; 3) There is no evidence for any superiority of the S-R order in mediated association.

71 pages. \$1.50. Mic 56-2370

**THE EFFECTS OF VARYING THE CONCENTRATION OF A SUCROSE SOLUTION USED AS A REINFORCING AGENT IN A CHAINING SITUATION**

(Publication No. 17,086)

Thom Verhave, Ph.D.  
Columbia University, 1956

Five male rats of Wistar strain were trained in such a manner that pulling a metal chain in darkness produced a light after a variable interval of time, the mean interval being 30 seconds. In the presence of the light, after a fixed interval of time, a chain-pull produced a sucrose solution reinforcement and terminated the light. This was done in order to establish a two-member chain, and to determine the effect of changes in concentration of the reinforcing agent on the rates of the two members of the chain.

Different animals were run under different motivational

conditions of either 80% ad lib weight, or a 22 3/4 hours water deprivation rhythm added to a food deprivation level maintained at 80% of ad lib weight.

Seven different sucrose concentrations ranging from a 2% to a 32% concentration were used. Two determinations of the rate were made at each concentration. The concentrations were presented in different orders for the different animals.

The main findings can be summarized as follows: rate of responding increases with increased concentration of a sucrose solution, used as a reinforcing agent, and reaches a maximum near 21.1%. Simultaneously, the animals returned to the chain faster with increasing sucrose concentrations. The latency-concentration function reaches a minimum near the 20.1% concentration.

No evidence was obtained for the development of a light-dark discrimination in 2 of the 3 animals on which checks for its occurrence were obtained.

69 pages. \$1.50. Mic 56-2371

## RELIGION

**PARADOX WITHOUT ANGUISH: A CRITICAL STUDY OF MARTIN BUBER'S EXISTENTIAL PHILOSOPHY OF RELIGION AND ETHICS**

(Publication No. 17,050)

Malcolm Luria Diamond, Ph.D.  
Columbia University, 1956

This dissertation correlates the influential dialogic philosophy of the contemporary German Jewish existential thinker, Martin Buber, with his highly individualized interpretation of Judaism, based almost exclusively on his reading of Old Testament Prophecy and Hasidism.

The work is divided into an introduction and three parts. The Introduction pays tribute to the greatness of Buber's total achievement which embraces a wide variety of fields. It delimits the study and calls attention to some singular aspects of Buber's career, especially that of his profoundly Jewish thought being more influential in Christian than in Jewish circles. The title, "A Prophet in Philosophical Clothing," derives from the hortatory power of his prophetic mission, which in philosophical contexts sometimes leads him to employ declamation in lieu of cognitive argument.

Part One deals with Buber's dialogic thought, the philosophy of "I and Thou," set in the context of the immediate personal intuition of reality which characterizes all Existentialists. Buber's basic intuition is of the "other" concretely bodied over against the self, a "Thou" with whom one enters into an exclusive, immediate, non-utilitarian relation whose spontaneity frees it from the causal sequence of time-space. The paradigm for this relation is love between man and wife, and it is the bearer of the meaning of life. Contrasted with it is man's only other basic approach to being, the detached, orderable, verifiable, knowledge of an object, of an "It" that can be used.

Part Two presents Buber's view of revelation as a dia-

logic encounter between man and the eternal "Thou"—God, an encounter which even in its biblical form is continuous with the "I-Thou" encounters of every day life. Israel received revelation as a people—they were to realize the divine demand by establishing a community of justice and truth. The community is also central to the faith of Israel as the bearer of the revelatory tradition which the individual appropriates. His treatment of revelation owes much to Kierkegaard, especially in its insistence on a personal appropriation of the truths of revelation which yields no objective certainty. The individual must affirm these truths in "holy insecurity," recognizing that life can afford him no guarantee against error and meaninglessness.

Buber's elaboration of the content of revelation abounds in paradoxes. However, his affirmation of the paradoxes of faith utterly lacks the agonized quality found in statements of them by Kierkegaard and other Pauline thinkers, and since the same distinction prevails in his ethical thought, this dissertation is called Paradox Without Anguish.

In Part Three Buber's dialogic exposition of ethics and the relation between ethics and religion is studied. His ethics emphasizes creative spontaneity in response to concrete situations—an emphasis which brings him perilously close to antinomianism. But by insisting that love between God and man and between man and man is the basis of both religion and ethics, and by claiming that love is an ontological relation, he tries to arrive at an ontological level which at once overcomes the antinomian tendency of his ethic of responsibility, and the possibility of conflict between religion and ethics.

Buber's optimistic view of man's capacity to fulfil the divine demand is contrasted with Reinhold Niebuhr's paradoxical view of man's inevitable involvement in sin—a view which emphasizes man's need for divine grace far more than does Buber, who again presents Paradoxes Without Anguish.

Buber, as all Existentialists, faces the problem of communicating his personal intuition of existence to men who do not share his perspectives. Throughout the work—in the context of his philosophy of "I and Thou," his existential view of revelation, and his ethic of responsibility—his attempts to move beyond existential statement to ontology are contrasted with those of Paul Tillich. It is concluded that the latter's method of cognitive argument is more appropriate to this task than is Buber's method of prophetic pronouncement.

300 pages. \$3.85. Mic 56-2372

**THE BOGOMIL MOVEMENT: AN INVESTIGATION  
OF THE ESSENTIAL CHARACTERISTICS OF  
THE "BULGARIAN HERESY" WITH SPECIAL  
REFERENCE TO ITS PURITAN ASPECT  
AND SOCIAL IMPLICATIONS**

(Publication No. 16,598)

Nicholas Nikoloff, Ph.D.  
New York University, 1956

**The Problem and its Importance**

The purpose of this investigation is to arrive at a clearer understanding of the nature and significance of the Bogomil movement of medieval Bulgaria by inquiring into its essential characteristics, viz., (1) its Puritanism, (2) its reform aspect, (3) its social significance and (4) its influence on medieval life and thought.

Modern investigators recognize the Bogomil movement as a major problem in the history of the Byzantines and the Southern Slavs. The influence which this movement has exercised on the Church and the State, as well as on society and literature in the Balkans, make the study of Bogomilism essential for both Slavist and Byzantinist.

**The Historical Background of the Problem**

Most of the earlier investigations of Bogomilism have been based chiefly on the writings of the medieval opponents and enemies of the Bogomils. Consequently, Bogomilism has been presented in the past as just another medieval heretical movement. However, investigators of the twentieth century, especially those who have studied the problem since 1920, have brought to light various aspects of the Bogomil movement, which have not been recognized hitherto. Because of these recent investigations Bogomilism has emerged from its obscure place in history and has taken its rightful position alongside other great movements which have had international significance.

**The Procedure in Collecting Data**

The first group of materials which were investigated were the writings of medieval Greek Orthodox opponents of Bogomilism. Among these were included some more recent works which contain translations of medieval writings as well as original texts with proper commentaries. The second group of materials which were examined were alleged Bogomil writings. Standard works in the field of medieval history, as well as text on church history, were investigated next. Finally, a thorough study was made of more recent investigations of the Bogomil problem by specialists in the field. Printed cards, size 4" x 6", in several colors, were used for the purpose of systematizing the collected data.

**The Results**

During the research the following significant facts were discovered: (1) Bogomilism began as a Bulgarian national movement under the leadership of priest Bogomil, during the reign of the Bulgarian King Peter who was under the strong influence of Byzantium; (2) Bogomilism was a protest against the social injustices inflicted upon the Bulgarian people by their rulers and Greek Orthodox clergy who were dominated by Byzantium. Bogomil and his associates advocated social reforms which would better the lot of the common Bulgarian people who were slaves to the ruling Bulgarian secular and church authorities; (3) The Bogomils protested against the corrupted official church, not only verbally, but also by demonstrating their Puritan principles in their everyday life; (4) The Bogomil protest irritated the secular and church authorities who branded the Bogomils from the very beginning as heretics, perhaps not so much because of doctrinal errors but because they considered them to be dangerous political enemies; (5) The persecution of the Bogomils in Bulgaria and Macedonia, favorable conditions in other lands, commercial intercourse between the Balkans and the West, as well as the Crusades which brought West Europeans in direct contact with the Bogomils—all these circumstances facilitated the spread of Bogomilism from Constantinople to France. Even Germany, Moravia and Russia felt the influence of this movement; (6) Catharik Patareni and Albigenses in Southwestern Europe were definitely influenced by the Bogomils and perhaps were offshoots of them.

**Conclusions**

The conclusions that may be based on the results of this investigation are as follows: (1) The strict moral discipline of at least the "perfect" who were the leaders of the Bogomil movement, cannot be explained apart from the principle of Puritanism which must have motivated all their actions; (2) The Bogomils criticized strongly the idolatrous practices of the Greek Orthodox clergy. One can detect in this attitude of the Bogomils strong elements of reform which were manifested several centuries before the Great Reformation; (3) Aside from its religious aspect, Bogomilism can be considered a great social revolt in which were emphasized the elements of social equality and personal freedom; (4) Internal evidence shows that Bogomilism had direct influence on the development of the Cathar movement in Southwestern Europe; the two branches of the Bogomils in Macedonia and Thrace were considered by the Western Cathars to have played a vital part in the establishment of all dualistic groups in Southwestern Europe.

**Implications**

A thorough study of the works of Byzantine writers, who deal with the Bogomil problem, may bring to light earlier sources which they might have used in their efforts to build a theological case against the Bogomils. The result of such a research undoubtedly will help future investigators of the Bogomil problem evaluate better the nature of possible heretical traits in the major doctrines of the Bogomils.

Some future investigator of the Bogomil movement may find it profitable to undertake a thorough research which would throw additional light on the religious reforms which Bogomil and his successors endeavored to introduce within the Orthodox Church.

147 pages. \$1.84. Mic 56-2373

**AN EVALUATION OF FIELD WORK GUIDANCE  
AT THE OBERLIN COLLEGE  
GRADUATE SCHOOL OF THEOLOGY**

(Publication No. 17,035)

Llewelyn Arnold Owen, Th.D.  
Boston University School of Theology, 1956

Major Professor: Dr. Sam Hedrick

**The Nature of the Problem:**

How can a student pastor at the Oberlin College Graduate School of Theology be helped to be more effective in his pastoral relationships through the School's field work program of personal guidance and supervision? Areas of concern: (1) effectiveness in pulpit ministry; (2) effectiveness in general pastoral work; and (3) strength of personal qualities bearing on professional skills.

**The Objectives of the Research:**

Ultimate objectives: (1) to furnish evaluation instruments on the personal abilities and pastoral skills of student ministers; and (2) to evaluate the effectiveness of group practicums and personal conferences as guidance methods. Proximate objectives: (1) to study the effectiveness of student pastors by means of (a) self-evaluation rating scales, (b) rating scale instruments used by parishioners, and (c) a questionnaire on which students evaluated the School's guidance methods; (2) to study the relationship of the student's grades to the evaluation of his field work; and (3) to show possible correlations between the various factors in the evaluation instruments.

**The Preparation and Procedures:**

(1) A review of relevant literature on (a) theological field work, (b) guidance education, and (c) research methods in the psychology of education and industry; (2) a sample survey, addressed to denominational leaders; (3) construction of evaluation instruments, using graphic rating scales; (4) administering of evaluation forms to student pastors and church officers; (5) administering of questionnaire on effectiveness of practicum and personal conferences; and (6) computing or rating scale responses by means of the tetrachoric correlation coefficient.

**Findings:**

- (1) That the evaluation instruments were reasonably satisfactory for the purposes for which they were designed: (a) as aids to practicum leaders and faculty counselors in securing relatively objective data on the student's personal qualities and professional skills; (b) as a means of reducing the amount of guesswork in constructing student profiles for counseling purposes; and (c) as a help in determining the effectiveness of the School's guidance methods;
- (2) That there is need to refine certain scales of the instruments to make possible more sensitive and accurate responses (for example, the scale for sense of religious vocation which is too highly subjective as written);
- (3) That there is need to discover more effective methods of instructing parishioners on how to observe and rate a student pastor;
- (4) That ratings by parishioners were considerably higher than self-ratings except on the factor of cooperation;
- (5) That correlation of grades with the ratings of parishioners provided invaluable data for counseling pur-

poses (especially directing attention to the above and below-average student);

(6) That a comparison of grades in practical courses with those for studies of a theoretical nature indicated, on the whole, that students were slightly better in their work in the practical fields;

(7) That 39 of 43 student pastors felt a need for both practicum and personal conferences as guidance methods in meeting non-academic problems;

(8) That students had an average of five personal conferences with faculty counselors, concerning non-academic problems, during the first semester of 1955-56;

(9) That there is need to discover more effective practicum methods by means of which the high-level student can be challenged to surpass his present degree of excellency;

(10) That literature in the fields of educational guidance and industrial psychology contains many suggestions applicable to practices in theological education;

(11) That, in general, a study of the area of practices and field work guidance, might be undertaken more effectively on a cooperative basis than by a single seminary, with two or more schools sharing in research.

171 pages. \$2.25. Mic 56-2374

**CONVERSION IN CHRISTIAN EDUCATION  
AND REVIVALISM**

(Publication No. 17,036)

Robert Varnell Ozment, Ph.D.  
Boston University School of Theology, 1956

Major Professor: Dr. Donald More Maynard

**PROBLEM:** The problem of this dissertation is to determine the development of the views of conversion in the Christian church. This study is concerned with cataclysmic and gradual growth conversions as represented by revivalism and Christian education respectively. Points of agreement and disagreement between the two methods have been indicated and an attempt to find a mediating position between the two has been made.

**PROCEDURE:** The major works of men who represent each era in Christian history from approximately 30 A.D. to the present have been studied to determine the position held by the church with regard to conversion. Careful analysis of the information gained from a sampling of the books and articles written on the subject has made it possible to present the views of the church concerning conversion as a basis for a mediating position.

**FINDINGS AND CONCLUSIONS:** Throughout the history of the church one can observe contrasting views with regard to conversion. Some regard it as sudden in nature while others stress its gradual character.

Little emphasis was placed upon the phenomenon of conversion in the early church. During this period the method of conversion was generally never questioned.

Conversion during the Apostolic period implied a change in the intellectual and moral disposition of an individual.

The Apologists sought to convert pagans by instructing them in such a manner as to show that Christianity is ethically and intellectually sound.

During the fifth century the controversy between Pelagius and Augustine indicated the position the church held concerning conversion. The Pelagian view was in keeping with a gradual growth experience, while Augustine's view was in keeping with a sudden experience.

The church during the middle ages witnessed a period of wholesale conversions. Many people were received into the church with little or no instruction concerning Christianity.

During the sixteenth, seventeenth, eighteenth, and most of the nineteenth centuries conversion was considered essential for church membership. During the twentieth century conversion has been considered synonymous with 'decision' or commitment.

Psychological studies of the phenomenon of conversion indicate that what appears to be a quick modification in personality is much less abrupt than it may appear. Edwin Starbuck, William James, George A. Coe, James Pratt, and Alfred Underwood felt that if we knew all about the subliminal elements in conversion, the experience would prove to be one of gradual growth.

Albert Knudson viewed man as a creature who needs salvation because of his own imperfections and not because of original sin. Conversion takes place as a result of the normal experience of man's committing himself to God's will. In contrast, Reinhold Niebuhr viewed man as a sinner and indicated that educational efforts to convert man are futile.

This study will indicate that:

1. It is incorrect to regard evangelism and Christian education as being mutually exclusive. It would also be erroneous to regard them as being synonymous or equivalent. They are parts of the same process. They are not antagonistic toward each other when rightly understood.

2. The religious attitudes of the subject are the same after either a cataclysmic or a gradual experience. Both imply a direct dependence upon God. Both are means of bringing people into a right relationship with God. If evangelism and Christian education are to complete their work, there must be an interfusion of intellectual comprehension and emotional consent.

3. Both approaches, sudden conversion and gradual growth, imply a dependence upon God and assume that both man and God take initiative in the experience. For either sudden conversion or gradual growth to take place man must have within himself the capacity to make a religious response.

4. In general, Christian nurture is to be preferred over more sudden conversion experiences. However, if formation does not take place, then reformation is necessary. The church will need to use both methods in its total approach.

5. The best results can be attained when Christian education and Revivalism are not antagonistic toward each other, but rather when they cooperate with each other.

322 pages. \$4.15. Mic 56-2375

## THE RELIGIOUS EXPERIENCE OF THE COLONIAL AMERICAN MORAVIANS

(Publication No. 17,079)

Edwin Albert Sawyer, Ph.D.  
Columbia University, 1956

This is a study of the religious experience of the Moravians in America from 1740 to 1770, primarily in the Pennsylvania communities of Nazareth and Bethlehem, in the North Carolina settlements at Bethabara and Salem and in the numerous Christian Indian villages of Pennsylvania and Ohio. Enthusiastic, anti-rationalistic, emotional, introvert and revivalistic, the experience had clearly marked roots in German Pietism and derived its motivation from a contemplation of the Man on the cross. It possessed a well-starched ethic which is reflected in the various community codes that were written. Its outstanding means of self-expression was its vast missionary enterprise to the American Indian, the West Indian slave, the religiously unattached American and to remote foreign peoples. In its domestic application, it nerved its members to faithfulness in their day-to-day work and offered a fellowship that sang its way into the frontier wilderness. The message which it regarded as central was that Christ may be experienced as the concretely present Saviour, felt inwardly, in the heart, rather than accepted only in the mind.

Two types of leadership among these people were discernible. One had a tendency toward fanaticism, with excessive emphasis on the blood and wounds of Jesus. This was represented by John Nitschmann and John Frederick Cammerhof, and by Count Zinzendorf in the years of excess known as the Sifting Period. It originated in the Wetteravian settlements of western Germany and is described here in the lives of the leaders just mentioned and in those of some two hundred who immigrated to America in 1749 and 1751. These two hundred are studied from the memoirs they left behind, memoirs that trace their life and thought from adolescence down to the grave. Some were single men who formed a unique community at Christiansbrunn, Pennsylvania. Others were laborers, craftsmen, housewives or professional people, but each one part of a dedicated community.

The more conservative type of experience was represented by August Gottlieb Spangenberg and Peter Böhler, both skilled colonizers, evangelists and masters of German higher learning. Through their firm influence, the conservative experience prevailed and produced in the American Moravian settlements a solid and thrifty unification of the secular and the sacred. The latter was enjoyed by the thousand and more white colonists and by a like number of Indian converts, gathered primarily through the life-long efforts of the inimitable David Zeisberger.

Individual needs were taken into account through division of the community into "choirs," while the sense of corporate fellowship always stood out. Evangelism was stressed, by which all races and classes should be presented with the message of salvation in Christ as a thing joyfully to be appropriated in faith. This faith, perhaps expressed best in Spangenberg's idea of simplicity, is an empirical rather than a dogmatic quantity. Thus, the Moravians suggest religious experience as a possible basis for fellowship and church union, rather than uniformity of creed. The enduring value of their experience probably lies in the emphasis it gives to the need for balance in re-

ligion between the head and the heart.

The study comprises eight chapters, as follows:

- I. Introduction -- What is religious experience?
- II. The Central Figure -- Count Zinzendorf
- III. Spangenberg and the First Moravian Settlements in America
- IV. Zinzendorf in America (1741-1743), and Later
- V. The 1740's -- High Tide in America, Ebb in Europe
- VI. The Lesser Lights -- Settlers in Pennsylvania and Wachovia, North Carolina
- VII. The Gospel among American Indians
- VIII. Significance and Continuing Influence

323 pages. \$4.15. Mic 56-2376

#### FOUR GOSPEL TEXT OF EUSEBIUS

(Publication No. 17,037)

Domenico Volturno, Ph.D.  
Boston University School of Theology

Major Professor: Dr. David Kwang-Won Kim

#### 1. Statement of the Problem.

The purpose of this research is to determine the Four Gospel text of Eusebius. That is, to determine the manuscripts or sources used by Eusebius when quoting from the Gospels of Matthew, Mark, Luke and John. These Patristic quotations are valuable because they permit us to localize and date the various kinds of texts in manuscripts and versions, and thus to reconstruct the original autographs of the New Testament Gospels.

#### 2. Procedure.

The present study includes the collection of Eusebius' quotations from the Gospels of Matthew, Mark, Luke and John found in all of his extant Greek writings. After careful examination and evaluation, these quotations were collated with the Textus Receptus and attested to by the available witnesses. In addition, Eusebius' readings found in Demonstratio Evangelica which agree with the Textus Receptus were examined and attestation made. All of the readings with attestation were then examined and evaluated in order to determine the text-type.

#### 3. Summary and Conclusions.

The results of the present study show that the text of Eusebius in the Gospels is mixed. That is, he did not follow any one particular text exclusively when quoting from the Four Gospels. In fact, he used most of the so-called 'major witnesses'.

There were 416 variants in the Gospel of Matthew. Origen 'Aleph B and D respectively, support Eusebius most frequently. Examination of 198 readings found in Demonstratio Evangelica alone reveals that Eusebius is most frequently supported by Origen 'Aleph and D. The Bohairic Version B Theta and Codex 1 are secondary witnesses.

Due to the scarcity of quotations, there were only 76 variants in the Gospel of Mark. Theta D and 565 respectively, supported Eusebius most frequently. 'Aleph L B and 892 are secondary witnesses. The identical results were obtained when the 58 variants found in Demonstratio Evangelica were examined.

There were 160 variants in the Gospel of Luke. 'Aleph B L and D form the primary group of witnesses to Eusebius, while Codex 1 131 W 892 and 209 form the secondary group. Almost identical results were obtained when the 85 variants in Demonstratio Evangelica were examined.

There were 167 variants in the Gospel of John. 'Aleph B and L form the primary group of witnesses to Eusebius; W Origen and D the secondary group; and Cyril of Alexandria, Theta, Chrysostom and the Bohairic Version the tertiary group.

Examination of the readings in Demonstratio Evangelica in the Four Gospels which agree with the Textus Receptus reveals that the Byzantine witnesses agree with Eusebius almost 100%. However, these very same witnesses showed an extremely low correlation with the text of Eusebius when the readings which differ from the Textus Receptus were examined. Members of Fam Theta (especially 209 118 700 and 1) followed the same pattern, except that they showed a higher correlation with the readings of Eusebius which differ from the Textus Receptus. In contrast, 'Aleph B and D showed the opposite trend. It is the conjecture of this writer that Eusebius' text, as well as the text of Fam Theta, have been corrected to read with the Byzantine text.

The present study also reveals that Fam Theta is not a unity. In the Gospel of Mark a close affinity exists between Theta 565 and D. In the Gospels of Matthew, Luke and John a close affinity exists between 'Aleph B L and Theta 1 700. These facts point to the possibility that the Caesarean text is really a correction of the Western text by the Neutral.

487 pages. \$6.20. Mic 56-2377

## SOCIAL PSYCHOLOGY

### LEADERSHIP, MOTIVATION AND ATTITUDES IN TWENTY RESEARCH LABORATORIES (Publication No. 17,411)

Howard John Baumgartel, Jr., Ph.D.  
University of Michigan, 1956

Chairman: Daniel Katz

This study is based on data from a questionnaire survey and scientific performance assessment carried out in a large medical research agency by the Survey Research Center. The first objective of the study was to explore the interrelationships among various aspects of the morale of the scientists in the 20 research laboratories in the subject organization. A number of relatively independent dimensions were identified. Four of these dimensions constituted the dependent variables of this study. These were: task motivation (importance of science objectives), sense of progress (toward science objectives), internalized work pace (self-source), and attitude toward the leader. Although the laboratories varied in size and composition, the laboratory was chosen as the unit of analysis to represent hierarchically structured organizational units larger than the work group.

The second major objective was to test three hypotheses about the relationships between selected leadership variables and the four dimensions of morale. The three hypotheses concerning leadership were as follows:

- I. The task relevance of the leader will be positively related to three morale dimensions: task motivation, sense of progress, and internalized work pace.
- II. The leadership pattern of the leader (laissez-faire, participatory, or directive) will be associated with four morale dimensions: task motivation, sense of progress, internalized work pace, and attitude toward the leader. Units with participatory leadership will be high on these dimensions; units with directive or laissez-faire leadership will be low.
- III. The conformity of the leader to the role preferences of his subordinates will be positively related to the attitude toward the leader.

The task relevance of the leader was measured by an index based on the leader's scientific performance, his motivation and sense of progress toward science goals, and an internal source of work pace. The leadership pattern was identified in terms of two coordinate dimensions of decision process--decision locus in the hierarchy, and degree of involvement in decisions. Role conformity was measured by the discrepancy between the subordinates' reports of the leader's actual behavior in making decisions and their preferences concerning his behavior in this regard.

The findings of the morale analysis supported the pre-

vious findings that morale is a multi-dimensional variable. The first leadership hypothesis received generally strong support. The second hypothesis was strongly supported with reference to sense of progress and selected attitudes toward the leader, particularly the evaluative items. The effects of the leadership pattern on the sense of progress of the laboratory were, however, greatest for those scientists who report directly to the chief. There was only moderate support for the predicted influence of leadership pattern on task motivation, and no support for the predicted relationship with internalized work pace. The third leadership hypothesis received strong support, particularly with regard to the attitudinal items dealing with affect toward the leader.

165 pages. \$2.20. Mic 56-2378

### THE RELATIONSHIP OF ATTRACTION, NEED ACHIEVEMENT, AND CERTAINTY TO CONFORMITY UNDER CONDITIONS OF A SIMULATED GROUP ATMOSPHERE

(Publication No. 17,419)

Harry Alden Burdick, Ph.D.  
University of Michigan, 1956

Chairman: Edward L. Walker

Conformity, as a special type of behavior change, has come increasingly to be recognized as a significant problem for persons engaged in the study of human behavior. In this study an attempt was made to create three highly controlled experiments where major variables could be examined in a systematic fashion. The variables studied were: "attraction to the group," "need for achievement," and "certainty of the appropriateness of original position." Experiments I and III offer the major substantive results; Experiment II corroborates the contention that the manipulations were satisfactory. Throughout this study and the project of which it was a part, there was a major interest in using these variables, alone and in combination, to provide answers to the question, 'What kinds of persons will show the most conforming behavior under what kinds of conditions?'

The technique utilized for the study of conformity was that of the simulated group atmosphere. By simulated group atmosphere is meant a technique whereby a pre-arranged tape recording is used to create the impression for the critical subject that he is in communication with others. Subjects came into the laboratory to carry out a group discussion about a case of a juvenile delinquent. They were told that they would carry out this discussion over a microphone and earphone communication network in order to enhance our study of social communication. Actu-

ally, they all heard the same voices discussing the case, for these voices were played to them through their earphones from the tape recorder. The position regarding the case that the "other persons" took was different from that of the subject. Periodic measurement was obtained, and thus any change that took place in the subject's opinion as he presented it was observed. In this fashion the stimuli impinging upon the subjects were controlled.

Two degrees of attraction to the group were created. In Experiment I, contrary to expectations, a greater degree of conformity associated with being in a more attractive group was not observed. This finding led to a reconceptualization of conformity. Conformity was conceived as an instrumental act, fitting into the behavioral sequence paradigm of Need----Instrumental Act----Goal. With this reconceptualization Experiment III was designed and carried out.

In Experiment III instructions were changed so as to make conformity instrumental to being liked better by the other persons. With this change, consistent evidence that persons liking the group more showed more conforming behavior was found. Similarly, it was now found that persons who perceived themselves as being liked better by the others changed their opinions more.

Another hypothesis predicted that we would find that persons high in need for achievement would conform less than would persons low on this measure. Need for achievement scores were obtained for the subjects, and the results supported the prediction.

Another hypothesis stated that persons who were less certain of their original position on the issue would conform more than persons who were more certain. The degree of certainty which the subject felt about the issue was measured and again the prediction was supported.

Finally, in a more general sense, these experiments present evidence that the simulated group atmosphere is a satisfactory method of data collection for the study of these kinds of problems. It had been felt that it had the advantages of increased control of stimulation impinging upon the subjects, and economy in the utilization of experimental subjects. Further, regarding methodology, evidence has been offered that suggests that the selection process, wherein subjects volunteer from a classroom situation, may result in the obtaining of a sample of subjects higher in need for achievement than their fellow classmates who do not volunteer.

111 pages. \$1.50. Mic 56-2379

#### INTENSITY OF ATTITUDE, PERSONALITY VARIABLES AND ATTITUDE CHANGE

(Publication No. 16,848)

La Verne Fisher Irvine, Ph.D.  
Stanford University, 1956

The present research concerned the relationship between personality variables (anxiety, authoritarianism, and hostility) and the intensity (or strength) with which attitudes are held. The relationship between intensity of attitude and amount of change in attitude following exposure to printed educational material was also investigated.

The present research was concerned with anti-Semitism. A positive relationship was predicted between

intensity of attitude and each of the personality variables. A negative relationship was predicted between intensity of attitude and amount of change in attitude following exposure to favorable printed material.

The first of the study's two experiments used a sample of subjects enrolled in a Stanford University class of general psychology and investigated the relationship between each of the personality variables and intensity of attitude. One hundred and two subjects completed questionnaire measures of anti-Semitism, manifest anxiety, authoritarianism, and hostility; a rating scale concerning over-all intensity of opinions toward Jews; and a biographical information sheet. The Pearson product moment correlation coefficients computed between the intensity variable and each of the personality variables did not differ significantly from zero. Significant differences ( $P < .01$ ) were found between male and female group means in authoritarianism and hostility with males scoring higher than females. Significant intercorrelations ( $P < .01$ ) were found between anxiety and hostility (.43), authoritarianism and hostility (.38), authoritarianism and anti-Semitism (.57), and hostility and anti-Semitism (.27).

The second experiment used a sample of summer session subjects enrolled in psychology courses at San Jose State College and studied the relationship between intensity of attitude toward Jews and the amount of change in attitude following exposure to printed material regarding Jews. One hundred and seventy subjects were equally divided into an experimental and a control group. The subjects completed a pretest measure of anti-Semitism and a measure of intensity concerning Jews. In a posttest session, one week later, the subjects filled out a second form of the anti-Semitic measure, the measure of intensity, and a biographical information sheet. Before filling out the post-test measures the experimental group had read an article favorable toward Jews and purporting to have appeared as a feature article in the New York Times. The control group had been exposed to neutral material consisting of an article about Death Valley National Monument. It was first demonstrated that a significant net shift in attitude in favor of the experimental group had been experimentally induced between the pre and post anti-Semitic measures. The data from the experimental group were then used to test the hypothesis concerning the relationship between intensity of attitude and amount of change in attitude following exposure to the printed material. The Pearson product moment correlation coefficient for intensity versus change did not differ significantly from zero. It was also noted that there was no evidence of a significant sex difference in the amount of change taking place between the pre and post anti-Semitic tests.

In conclusion it may be stated that the predictions stating positive relationships between intensity of attitude and the personality variables of anxiety, authoritarianism, and hostility were not confirmed. The prediction of a negative relationship between intensity of attitude toward Jews and the amount of change in attitude following exposure to printed material was also not substantiated. Significant sex differences were found on two of the variables as well as significant intercorrelations between several of the variables.

125 pages. \$1.70. Mic 56-2380

**SOCIAL CONFLICT AS A SUBJECT OF INVESTIGATION IN AMERICAN RESEARCH FROM 1919 TO 1953**

(Publication No. 16,597)

Rhoda Lydia Lawner, Ph.D.  
New York University, 1956

Purpose of the Study

The purpose of this study is to determine the nature and extent of scientific and scholarly investigation in the United States into the subject of social conflict, during the 35-year period following World War I.

Methodology

This study is delimited to the consideration of works dealing with destructive social conflict, that is, opposition between groups which serves to impede the democratic process.

A search of the literature yielded a bibliography of 1,417 books and papers published in the United States between 1919 and 1953, on the subject of social conflict.

The bibliography is arranged in chronological sequence, and is alphabetized by author, within each year.

From the literature, 200 studies were selected which illustrate the development and varieties of research into social conflict. These studies are individually analyzed in the Appendix to the dissertation, in terms of purpose, research design, methodology, and findings.

The following classification system was selected for the social conflict research, derived from Giles'<sup>1</sup> method of Conflict Episode Analysis:

**I. STUDIES OF HOSTILE ATTITUDES: THEIR DESCRIPTION; CAUSES; AND EFFECTS**

Included here are studies of attitudes toward various racial, national, and religious groups; toward class stratification; and toward relations with other nations; studies of attitudes of whites toward Negroes; of Negroes toward whites; studies comparing Negro and white social attitudes; studies of attitudes of various minority groups; and studies of the causes and effects of hostile attitudes.

**II. STUDIES OF HOSTILE BEHAVIOR: ITS DESCRIPTION; CAUSES; AND EFFECTS**

Included here are studies of personality development and behavior of minority group members; studies of behavior in various communities; and studies of specific conflict episodes.

**III. STUDIES OF METHODS FOR THE TREATMENT OF SOCIAL CONFLICT**

Included here are studies of the effects of information; contact; suggestion; and psychotherapy; and the role of community agencies and social scientists.

**IV. STUDIES OF TECHNIQUES FOR THE INVESTIGATION OF SOCIAL CONFLICT**

Following classification and descriptive analysis, the studies were critically evaluated with respect to their objectivity, thoroughness, and verifiability; their ingenuity; and their practical implications.

Findings

1. The bulk of the social conflict research has dealt with
  - (a) hostile attitudes rather than hostile behavior;
  - (b) the description of hostility, rather than its causation;
  - (c) the attitudes of majority groups toward minorities, rather than vice versa.
2. There has been a moderate amount of investigation into the treatment of hostile attitudes, but the results have been highly inconclusive.
3. Most studies, prior to the 1940's, were performed in school settings---the majority using college students as subjects. This biased sampling prevents generalization of the findings.
4. Prior to the 1940's, the attitude research was largely repetitive and sterile,---dominated by unstandardized paper-and-pencil tests of unknown, but probably low validity.
5. The research in the 1940's and 1950's has been characterized by considerable ingenuity. Techniques for obtaining data now include projective techniques; sociometry; non-directive interviewing; group discussion; psychoanalytic data; interdisciplinary observation of communities, etc.
6. The more recent social conflict research possesses greater complexity (probing more than one dimension of conflict at a time); greater specificity (probing attitudes toward specific and real persons and events); greater depth (obtaining more thorough data about the subjects studied); and greater subtlety (probing attitudes through indirection).
7. Among the most creative influences coming to bear actively upon the social conflict research in the 1940's, were the Gestalt and the clinical approaches.

Recommendations Concerning the Future Social Conflict Research

1. More efficient selection and planning of research, so as to build upon what has been done previously;
2. Coordination of interdisciplinary research, with adequate field and clerical staffs;
3. Identification through a master-directory, both alphabetically and geographically arranged, of all social scientists and scholars having training and experience in social conflict research;
4. Training programs for new scholars in this field;
5. Training of social scientists and scholars in this field to include more emphasis on history and government;
6. Search for means of integrating the work of social scientists into government administration;
7. The constant recording and analysis of all types of actual conflict situations and episodes in community life, education, occupational life, international relations, etc., so as to eventually derive principles regarding the nature, causes, and treatment of social conflict. Utilization of Giles' method of Conflict Episode Analysis is indicated for this task.

448 pages. \$5.60. Mic 56-2381

1. H. H. Giles, "Conflict Episode Analysis---a Tool for Education in Social Technology." Journal of Educational Sociology, XXVI (May 1953), pp. 418-33.

## SOCIOLOGY

### SOCIOLOGY, GENERAL

#### FUNCTIONAL ORGANIZATION IN METROPOLITAN AREAS: AN ECOLOGICAL ANALYSIS OF STANDARD METROPOLITAN AREAS' EMPLOYED LABOR FORCE DISTRIBUTIONS AMONG VARIOUS INDUSTRIAL GROUPS, 1950

(Publication No. 17,410)

Thelma Frances Williams Batten, Ph.D.  
University of Michigan, 1956

This study is an attempt to describe and predict the distributional patterns among various industrial groups of all 168 Standard Metropolitan Area (SMA) employed labor forces in 1950. The work represents an approximation to the study of functional organization in human communities, particularly in that type called the metropolitan community.

Two different, but essentially complementary, methods were used to derive patterns of functional organization present in the SMAs. The first approach was primarily a direct examination of the labor force distributions in an attempt to see the existent patterns, if any. The second approach involved classification of the SMAs according to different variables thought to be significantly related to functional organization. The distributions of the mean or average values for the resulting classes were taken as patterns, with the deviations around the means indicating conformity or nonconformity to these patterns.

Under the first approach the SMAs were grouped according to the four largest proportions, in order, in their labor force distributions. A majority of the SMAs could be placed into a small number of classes with the same first four peaks, but for the remainder there were almost as many combinations of the four peaks as there were SMAs. The best generalization that can be made is that "manufacturing" tends to be the largest proportion, "retail trade" the second largest, while "personal services and entertainment" and "professional services" are about equally likely to be third or fourth.

Under the second approach the SMAs were classified according to five main variables, taken one at a time: population size, income, proportion of the labor force in manufacturing, distance to nearest SMA, and geographic location. The SMAs were later simultaneously classified by the two variables singly providing the best predictive results, proportion in manufacturing and geographic location.

This double classification was found to enable quite good prediction of the distribution of the labor force among the various industrial groups. The overall pattern shown by the means for these classes is one of increases in the proportions in all the remaining industrial groups as the proportion in manufacturing decreases. There are even gradations, not abrupt changes, in the patterns for the classes--or functional types if this terminology is preferred. These gradual changes in pattern are associated with both geographic region and proportion in manufac-

ting. As we move from East to West and let manufacturing decline within each region, the changes are orderly, with the North Central beginning with the last pattern in the North East while the South begins with the last pattern in the North Central. The West, which contains very few SMAs, is somewhat erratic in pattern.

174 pages. \$2.30. Mic 56-2382

#### THE IMPACT OF METROPOLITAN DECENTRALIZATION ON A VILLAGE SOCIAL STRUCTURE: A STUDY IN SUBURBANIZATION AND SOCIAL CHANGE

(Publication No. 17,154)

William Mann Dobrin, Ph.D.  
Columbia University, 1956

The phenomenon of suburbanization has only recently come to the serious attention of students of social organization. There seems to be a particular need for specific case analyses of what appears to be a wide range of suburban community "types." Toward this end, the principal concern of the research was in certain processes of suburbanization involved when a comparatively homogeneous and integrated village is rather suddenly caught up in a wave of intense metropolitan decentralization. Specifically, this empirical case analysis was focused on the impact of the newcomer suburbanites on the "oldtimer" social structure of a Long Island village.

The substantive empirical problems investigated in this study of social change and suburbanization were comparisons between the "villagers" and "suburbanites" in terms of (1) general status characteristics, (2) reference group orientations toward localistic (Gemeinschaft) or cosmopolitan (Gesellschaft) social structures, (3) the perception of social change occurring within the community, (4) informal relations within and outside of the community and (5) selective aspects of participation in the formal social organization of the village. Essentially these five areas of empirical interest provided data on (1) a general contrast in "styles of life" and certain dimensions of personality between the two residence populations and (2) certain aspects of transition in the social structure of the community resulting from heavy in-migration from the metropolitan area. The data was obtained from 275 questionnaires administered to a random sample of village residents and 60 interviews made among community leaders.

Certain broad patterns in suburbanization were seen in the impact of the newcomers on the village social system. (1) The newcomers were intensely involved with individuals, groups and events outside of the local village in the metropolitan area. In contrast, the villagers were much

more dependent on the local village. (2) Due largely to their cosmopolitan orientations and metropolitan attachments, the suburbanites do not perceive the village as a community whose ultimate destiny is intimately linked to theirs. In spite of the local orientations of the oldtimers there has been a substantial decline in the perception of the village as a unit of solidarity. (3) The delineating characteristic of the suburbanite world seems to be the residence location of the family. Many of the changes being effected in the village are directly traceable to the concentration of functions centered on the family. This clustering of traits, characteristic of the newcomer suburbanite world, suggests that the term "suburbs" best applies to those residential, family-centered communities within a metropolitan area which are culturally and economically dependent upon the central city but usually are independent of it politically.

257 pages. \$3.35. Mic 56-2383

**AN ANALYSIS OF THE IDEOLOGY OF  
A FRENCH CANADIAN NATIONALIST  
MAGAZINE: 1917-1954.  
A CONTRIBUTION TO THE SOCIOLOGY  
OF KNOWLEDGE**

(Publication No. 16,998)

Gerald Adelard Fortin, Ph.D.  
Cornell University, 1956

The purpose of this study is to explain the changes that occurred during a 40 year period in the ideology of a French Canadian nationalist magazine. The study is divided into two main parts: 1) a description of the changes, 2) an attempt to analyse and interpret those changes which took place.

The ideology is analysed in both qualitative and quantitative terms. In the quantitative content analysis, the material was classified in two ways: 1) in terms of the content of the subject-matters, 2) in terms of the interpretations given to these subject-matters.

Two major types of changes in the ideology were identified: 1) variations in the stress placed upon the subject-matters at different times, 2) differences in the interpretation of certain problems in the various periods. This study is primarily concerned with explaining the second type of changes.

In an attempt to understand these changes in interpretation, four main factors were considered: 1) the changes that occurred in the editorial staff of the magazine, 2) the logical evolution or immanence of the ideology, 3) the ideas of external groups, in particular the Roman Catholic Church, 4) the changes occurring in the substructures of the Province of Quebec, i.e., in economic activity, in industrialization, and in social stratification.

The main conclusions of the study are:

1) During the period studied, the goals of the ideology did not change while the means used to achieve these goals tended to change in accord with historical circumstances.

2) The substructures are not the only aspect of the situation that the sociology of knowledge must consider, for not all ideologies are related in the same fashion to these substructures. For example, while a change in the modes of production may mean a contradiction of the goals

of a social class, for the nationalist group which we studied this kind of change affected only the means of the ideology.

3) The main factors determining the evolution of this ideology were certain historical conditions and the way in which these conditions contradicted the goals of the ideology.

4) In our analysis, we found that an idea must correspond to a threatening situation in order to have momentum.

5) The prestige of an outside group may be sufficient to bring about the introduction of a new idea in the ideology. However, the emphasis placed on this borrowed idea is dependent upon its correspondence to the historical situation.

6) In the case studied, the changes and the composition of the editorial staff did not seem to be a primary factor relating to the changes in interpretation.

261 pages. \$3.40. Mic 56-2384

**SOCIAL SOLIDARITY AND DIFFERENTIAL  
ADOPTION OF A RECOMMENDED  
AGRICULTURAL PRACTICE**

(Publication No. 16,999)

Robert Harlan Fosen, Ph.D.  
Cornell University, 1956

The phenomena of social change have asserted their importance in the relatively brief history of American agriculture and rural life. The continuous transformation of faith in traditional folk beliefs to the adoption of scientific knowledge in farm management has been particularly striking. However, within the context of the present research, the author, among others, has observed that, while most New York State dairy farmers adopt recommended agricultural practices as their utility is demonstrated, many New York State dairy farmers who would benefit most by the adoption of these practices do not adopt them even after their utility has been demonstrated. The research problem is that of explaining this deviation from what has become a social change expectancy.

The methodology of the present research is organized around two distinct, although interrelated, propositions that constitute one theoretical construct. The first deals with the extent to which adoption of recommended agricultural practices might be explained and predicted as a function of in-group identification. The second proposition is concerned with the extent to which in-group identification, in turn, might be explained and predicted as a function of social solidarity. Hypotheses were deduced from these propositions and needed data were obtained through an interviewing schedule administered during the fall of 1955 to dairy farmers in Herkimer County, New York. These data were interpreted with respect to adoption of the recommended practice of artificially inseminating dairy cattle.

In accordance with the findings of this research in terms of the first proposition, the farmer who adopts practices has more identification with an in-group than does the farmer who does not adopt practices. Furthermore, the adopter has more identification with other adopters than the non-adopter has with other non-adopters. In short,

the farmer who adopts practices appears to be an individual to whom behavior norms have been transferred from a rather definite normative unit of other farmers in the community. His identification with a reference group is discernible. On the other hand, the farmer who does not adopt practices seems to be a person to whom behavior norms must certainly have been transferred, but the source of these norms is not apparent in a normative unit of other farmers in the community. His identification with a reference group is not discernible.

In accordance with the findings of this research in terms of the second proposition, in-groups whose members are similar in the extent of formal social participation, age, and size of farming operation have a higher social solidarity and, as expected, a higher in-group identification than in-groups whose members are dissimilar in these ways. In-groups whose members are similar in formal education, type of formal social participation, national extraction, extent of commercialization, religion, chief type of farming, length of residence on present farm, income, stage of family cycle, and length of time in the dairy business have no greater in-group identification than in-groups whose members are dissimilar in these ways.

In conclusion, farmers who adopt recommended practices tend to be persons who:

1. Belong to an informal social group of other farmers.
2. Associate more with others of the group who have adopted new practices than with others of the group who have not adopted new practices.
3. Appear to follow the farming standards set by the group to which they belong and by the persons with whom they associate.

Farmers who do not adopt recommended practices tend to be persons who:

1. Do not belong to an informal social group of other farmers.
2. Have little association with other farmers.
3. Appear to follow the farming standards set by traditional "Old World" values.

In short, the farmer who adopts practices tends to be an "outward oriented" and conforming member of a group, while the farmer who does not adopt practices tends to be a social isolate conforming to standards that have their source in traditional values. These informal social groups that influence the decisions of their members contain individuals who tend to be similar in the extent of their formal social participation, age, and in the size of their farming operations.

The results of the present research support the overall conclusion that adoption of recommended agricultural practices is, to a meaningful extent, a function of the informal social organization of the rural community.

108 pages. \$1.50. Mic 56-2385

#### A RESTUDY OF PLAINVILLE, U. S. A.: STRUCTURAL CHANGES IN THE STATUS RANKING SYSTEM OF A RURAL COMMUNITY

(Publication No. 16,955)

Art Gallaher, Jr., Ph.D.  
University of Arizona, 1956

Supervisor: William H. Kelly

This dissertation is concerned with changes in the status ranking system which have accompanied economic changes in a small rural community, and more importantly the processes by which these changes have occurred through changes in ranking criteria. The ranking system chosen for analysis is that based on social prestige.

The community analyzed was Plainville, U.S.A., previously studied by another investigator in 1939. The latter study demonstrated a relationship between the economic organization and the status ranking system of Plainville. This, combined with a survey of the literature, resulted in the formulation of the hypothesis that changes in economic methods, organization, and values in the rural community are accompanied by structural changes in the status ranking system of the community. The verification of this hypothesis, and more importantly, the way in which the change occurs, formed the basis for the present study. The concept of status ranking was employed to analyze the processes of change that have occurred in the culturally determined criteria for the establishment of differential social ranking in Plainville.

There is a statement of problem and field procedures, followed by a discussion of change in the physical setting, economic structure, religion, and general social organization. The status ranking system is then analyzed to determine changes in the ranking criteria and the processes that have resulted in these changes. It was found that the 1954 status ranking system had changed considerably from that identified in the 1939 study. Economic changes have been accompanied by a new importance assigned to achievement of status measured primarily in terms of money and its manipulation. This contrasts markedly with the emphasis upon ascribed criteria mentioned in the first study. Mention is made of several factors associated with the present Plainville social status system that indicate the possibility of a future crystallization of status differences.

270 pages. \$3.50. Mic 56-2386

#### THE AMERICAN VOLUNTARY HOSPITAL AS AN EXAMPLE OF INSTITUTIONAL CHANGE

(Publication No. 15,679)

Edith Margaret Lentz, Ph.D.  
Cornell University, 1956

This is a case study of institutional change, against which are considered various theories concerning the processes of social change and the nature of functional unity and structural constraint among institutions within a societal complex. The specific institution used for this purpose is the American community hospital.

The data was acquired during a five year research study conducted under the auspices of the New York State School of Industrial and Labor Relations and with the guidance and help of the American Hospital Association. It was subsidized in large measure by the Carnegie Fund of New York. The author was field director of this study and worked under the direction of Dr. Temple Burling.

An advisory commission was appointed to guide the research. Its members were drawn from positions of responsibility in the health field. With the help of this committee, a total of six hospitals was selected for intensive study. They were all general, non-profit, privately managed institutions for short-term care. They varied in regard to size, complexity of services and medical specialties, type of administrator, university affiliation, and geographic location. The study was done in the early half of the 1950's when hospitals were still in process of adjusting to war and post-war problems.

Social anthropological methods were used, and observations and interviews were made in all hospital departments, at all status levels, including trustees, administrative personnel, professional workers, sub-professionals, clerical staff and rank and file employees.

The thesis pattern follows that suggested by George Homans, presenting its data according to three major categories: environmental change affecting the voluntary hospital between 1900 and 1950; changes in the hospital's external system (the way it related itself to the changing environment by modifying its procedures); changes in the hospital's internal system (the patterns of relationship among its personnel and between them and the patients), and the way these three categories or systems interacted with each other.

Much of the exposition was centered around events in one hospital, selected for its representativeness, with comments made of major points of similarity and difference to other hospitals. Stresses within the internal system were illustrated chiefly by describing the struggle for power among the hospital's three top power groups; its trustees, administrator and doctors.

The theories which were considered in the light of the empirical data included those of the Marxist thinkers relating to the nature of social change; William F. Ogburn's concept of cultural lag and differential resistance to change; Max Weber's traditional and rational-legal institutional types and his concept of evolutionary development; the functionalist theories of the nature of social unity and structural constraint; and finally theories on the dynamics of change offered by George Homans and Robin M. Williams, Jr.

A concluding chapter deals with research areas suggested by this study. 174 pages. \$2.18. Mic 56-2387

#### CHANGE IN TRIBAL SOUTH AFRICA

(Publication No. 17,074)

Katherine Fox Organski, Ph.D.  
Columbia University, 1956

This is a study of social change among the Bantu who live in the native reserves of the Union of South Africa and the British protectorates of Basutoland, Bechuanaland and Swaziland. It is based upon material contained in anthro-

pological monographs, missionary journals, travellers' accounts and government reports, both British and South African, and covers the life of these people from the time of early European contact around 1800 down to the present day.

Unlike much of the "culture contact" literature on Africa, this study deals only with changes in the social life of the Bantu, i.e. with changes in the ways in which people customarily treat each other. The material has been divided into three broad areas: family patterns, economic patterns, and power and prestige patterns. Changes in these three areas of social life are described in terms of the structural concepts employed in the sociological approach referred to as structural-functional analysis: social action patterns, roles, relationships and norms. Processes of social change are also identified.

Family patterns are studied first. The pre-European Bantu family is treated as a relatively stable system of interdependent patterns. It is shown how various social action patterns reinforced each other, and how the traditional political, economic and religious systems of the South African Bantu helped to prevent changes in family life by placing power firmly in the hands of those who benefited most from the status quo within the family.

After European contact, the Bantu family system was subjected to two attacks: one religious and the other economic. It is shown how the missionaries failed to achieve their objectives because of their lack of adequate rewards and punishments with which to counteract the force of traditional Bantu socialization and social control. The introduction of European economic patterns, however, led to far-reaching changes in the Bantu family. Resocialization of the Bantu by the Europeans and the imposition of new, European social controls started a chain reaction of changes in the Bantu family system that continues to this day.

The economic system of the Bantu of the South African reserves is next described, first as a relatively stable system, then as a system undergoing alteration because of European contact. Strains in the pre-European economic system are located, but it is shown how other economic patterns and how family, political and religious patterns reinforced the existing economy and helped to prevent changes in spite of the strains that existed.

The diverse interests of the various Europeans who interfered in the Bantu economy are then described, and it is shown how through the combined forces of compulsion and attraction, the Bantu were led to alter their economic activities. The role of deviant behavior as a source of social change is emphasized.

Finally, the changing power and prestige system of the South African reserves is described. The traditional system is outlined. Attempts by the Bantu to absorb the first Europeans into their own political system led to failure, but the Europeans, for their part, have not succeeded in Europeanizing the Bantu. The present power and prestige system of the reserves is treated as an emergent system that differs from previous systems of both the Europeans and the Bantu. It is treated as an example of the importance of interaction between differing social systems in the production of social change. Social change stimulated by contact between representatives of differing societies is seen to be but one special case of a more general process of social change through interaction.

388 pages. \$4.95. Mic 56-2388

MARY RICHMOND AND THE RISE OF  
PROFESSIONAL SOCIAL WORK IN BALTIMORE:  
THE FOUNDATIONS OF A CREATIVE CAREER

(Publication No. 17,076)

Muriel Warren Pumphrey, D.S.W.  
Columbia University, 1956

Mary Ellen Richmond made one of the first attempts, and certainly the best known, to classify and elucidate the practices of the developing field of social casework. Her book, Social Diagnosis, is still regarded as a helpful reference work on social investigation and many of her writings contain nuggets of ideas as applicable today as when they were set down.

No one has made a detailed study of the way she functioned in the social work activity of her own time, and the steps by which she developed her theoretical concepts and methodology. Yet her formulations always grew out of the exigencies of practice--her own, in Baltimore and Philadelphia, and that of others as reported in records and institutes.

In assembling material for a biography, it became apparent that most of her life she was reacting to the way social work impressed her when she first observed it. Very little detail was known about that early period. As a preliminary to a definitive biography this study examines her earliest experiences from 1889 to 1900. It is a descriptive analysis of social work as she encountered it, and the literature of the field as it was first available to her.

Mary Richmond came from a lower middle class background, and clerical work experience. The first chapter describes what is known of her early life which influenced her professional performance. She was endowed with a brilliant mind, trained by circumstance to enjoy concentrated study and research, and possessed the capacity to arouse associates to share her enthusiasms. The charity organization movement appealed to her desire to leave the world a better place.

She entered social work just as it was becoming a paid occupation. It was still "charity," dominated by aristocratic condescension and religious obligation, carried on by volunteers with the help of poorly paid aids who acted as "agents" to carry out the will of the well-to-do. The literature consisted of broad theories about society or personal testimonies of good work done with no attempt to systematize the two.

She was fortunate in the agency in which she found herself, the Charity Organization Society of Baltimore, which was dominated by an enlightened group of professional men and Johns Hopkins University professors. The second section of this treatise analyzes the impact of this group upon her in her first learning experiences; the third describes the practice of the period when she first became executive and attempted to put theory into practice. She went through a period of disillusionment at the lack of specific method, the many failures in individual treatment, and the discrepancies between principles and practice.

There was a close relationship between her leisure time pursuits, discussed in Part IV, and her philanthropic interests. From reading, she carried helpful analogies and usable techniques into practice. From practice, she could point out the need for civic reform and popular education and recreation to her leisure time companions.

The final section depicts her attempts to change some

of the cumbersome practices, to supply missing aspects of philanthropy, and to work out a relationship between paid and volunteer leadership. At the end of her stay in Baltimore she set down a philosophic framework which would link practice and theory. This formed the basis for her later studies of the interrelationship of individual and social factors, and of the specialized functions of social work.

She began her work in Baltimore as an administrative assistant and ended it as one of the foremost leaders in philanthropy in the United States.

512 pages. \$6.50. Mic 56-2389

A STUDY OF THE RECRUITMENT, TRAINING,  
SUPPORT AND PERFORMANCE OF CHURCH  
LEADERS IN THREE PROTESTANT  
DENOMINATIONS IN THE PHILIPPINE  
FEDERATION OF CHRISTIAN CHURCHES

(Publication No. 15,620)

Henry Welton Rotz, Ph.D.  
Cornell University, 1955

Chairman: W. A. Anderson

A survey of 651 church leaders, 80 per cent of the total of those in the three Protestant Churches in the Federation of Christian Churches of the Philippines in 1952, was made by the author. These churches were the Baptist, Methodist, and the United Church of Christ (U.C.C.P.), the latter composed of the Congregationalists, Disciples of Christ, Evangelical United Brethren, Independent Methodist, and Presbyterian denominations. There were two goals: 1) to demonstrate to Mission Boards and church administrators the feasibility of using sociological survey methods as a technique for gaining information not now extant about mission fields and indigenous churches, and 2) to provide analyzed information for use by many types of administrators involved in the activities of the above churches and their supporting Mission Boards in the United States.

The special areas of study were: recruitment, training, support, and performance of the Philippine Church leaders.

The method used to collect the data was the mass interview conducted at thirty-six annual area meetings of church leaders by use of a schedule which allowed considerable freedom of response. Careful coding and sorting gave many tables of useful data which were incorporated into a thesis and which are summarized in the following paragraphs.

The Philippine Protestant Churches are in a precarious position in regard to the age of their leaders. Many of the latter are in the older age group and can be expected to be lost to the church in the next few years. There is a need for more rapid recruitment to replace this expected loss of leaders and to enable the church to expand into new fields.

Conversion precedes recruitment usually. Most leaders were converted between the ages of sixteen and twenty years, usually because of personal spiritual growth, the influence of parents or friends, or Bible reading. While some decided upon a church vocation at the same time they were converted, many others decided about nine years after their conversion. They made this vocational decision

primarily because they saw the great need for church workers.

The training of church leaders is a large and necessary task for the Church. Inadequate facilities for formal education intensify the difficulty of the task. A large group of inadequately trained leaders now in the church want to be further trained by home study courses or refresher courses in the Seminaries. The use of Bible Schools for pre-theological training would provide the necessary preparatory education for candidates entering Seminaries. The wives of leaders, because of their position in the community, need more educational opportunities. Church leaders have requested additional training in Theology and Doctrine, Homiletics, Bible, Church History, Church Administration, Stewardship, Evangelism, English, and Agriculture.

The Philippine community affects the Protestant Church in many ways. The smallness of this minority church causes leaders in many instances to serve more than one church. The leaders, as they move from place to place, report difficulty with the different dialects. The Sunday School is said to be deficient in number of classroom, equipment, and literature. High rates of illiteracy would presuppose intensive church activity in the field of literacy teaching, but it is generally neglected. There are more farmers in the church membership than any other occupational group as would be expected in a country so predominately agricultural. Percentages of tenant farmer members vary as to the location of the church in the Philippines, i.e., areas of high rates of tenancy on the land are reflected in the church membership. Religion is reported to be the most frequent cause of community conflict. The conflict pattern is Federation Church vs Roman Catholic Church, and Federation Church vs "sect" churches.

Church leaders in the Philippines usually receive income from three sources: cash salary, food gifts, and outside income. The Church provides approximately 60 per cent of the total income. Farming, fishing, and land ownership are the largest sources of outside income. The total income was considered inadequate by most leaders, and few had made any savings in the year of the survey. The income of members of churches is very low, so that the techniques of stewardship used by the leaders give indifferent results. The amelioration of the problem of the inadequate income of the church leader will come with the solution of the economic problems of the nation.

Six in ten of the leaders are ordained and one in five is Seminary trained. These facts affect the performance of the church leaders. Their stewardship promotion is nullified by the inexorable economic conditions of their country. They do not use the traditional "Lord's Acre Plan" and "The Church Farm" in promoting stewardship. They are sensitive to the agricultural needs of their people, but do not conceptualize the complicated total agrarian problem of the nation. They are lacking in books, Commentaries, and Concordances. More hours of study and more regular times of study are indicated as needs of the leaders. They do not participate widely in community affairs. They do not have a well rounded concept of "community" and do not recognize their responsibility of being a functional part of the community. They do not use specialized study groups for the consideration of special areas of need or interest. The church leaders' duties are decided by themselves alone--not as the result of a democratic procedure with the Church Board. Sermons tend to be long

(40 minutes), and reiterate the leaders' interest in size of church and the purity of the morals of their church members. They fail to organize extension and out-station work, and thus the expansion of Protestantism is curtailed. Further education is considered by the leaders to be the greatest aid to more effective service. More visitation, more administrative planning, the use of records, the participation of their Church Boards in planning, a more liberal idea of the function of church discipline, and greater participation on the part of church members would also increase the effectiveness of the leaders' service.

A study of three special types of leaders, women, Seminary trained, and ordained, was made.

The unordained women leaders provide a valuable corps of well trained and devoted persons. They constitute one-fourth of the total church leaders. They are used as Deaconesses, Bible Women, Kindergarten teaching, and Provincial Missionaries. They obtain their training in Bible Schools, and are very able in the performance of their duties.

The Seminary trained leaders are usually placed in larger churches, and, hence, generally have larger incomes. A very real problem in the Philippine Protestant Church is to find sufficient churches having adequate financial income to support the Seminary trained leader. These leaders often feel that their training gives them prestige, and there is the problem of convincing these men that this training is not an opportunity to escape continued hard work. These leaders are usually considerably more proficient in the performance of their services and duties than the untrained ones.

The ordained leaders are in insufficient supply. They receive larger incomes than unordained men. They highly respect their responsibilities and use the accepted techniques of pastoral service more frequently than the unordained men. They are loyal, devoted, and, when all factors are considered, are doing their work in an admirable manner.

A social group, namely, the Protestant church leaders of the Philippines, has been studied for the first time and information made available for widespread use by all administrators who need such information in the promotion, programming, and budgeting for the Protestant churches in the Federation of Christian Churches in the Philippines.

162 pages. \$5.78. Mic 56-2390

#### A STUDY OF ACCULTURATION IN AN AMISH COMMUNITY

(Publication No. 16,663)

Elmer Lewis Smith, D.S.S.  
Syracuse University, 1956

Purpose and Problem: The purpose of this study was to examine the historical role of Amish values; to determine the role beliefs and values play in contemporary life among the Amish; to examine the role the value system plays in maintaining and perpetuating the Amish social system; to describe some of the specific methods used to maintain social and cultural control and to report the degree to which the Amish system of control has been successful.

Procedure: The historical background of the Amish was

examined, focusing attention on the major values that have persisted through time. Contemporary Amish activities and practices were explored and described, in order to relate historically important values to everyday life. Finally, several selected sources of social and cultural change were examined in order to determine the amount of acculturation that has taken place.

**Findings:** The Amish differ from other Mennonite sect groups in the degree of conservatism with which they apply their beliefs in everyday life, and they differ from other religious groups in both degree and kind of values held.

In contemporary everyday life, the Amish indicate a close relationship between historically important religious beliefs and sociological forces such as: occupational choice, choice of a mate, family solidarity, attitudes concerning civic participation, pacifism, dress and personal adornment, and other activities and practices.

An examination of several selected sources of social and cultural change indicate:

1. The Amish are much less physically mobile than the non-Amish. Regulations prescribing the means of transportation have been an important means of limiting social and cultural contacts with non-Amish groupings.

2. The Amish belief in 'tilling the soil' as a life work has been maintained. Over 90% of the young Amish males take up farming as an occupation.

3. The Amish people have relatively little association with non-Amish persons.

4. The Amish have a complex family system, with relationships between families inextricably intertwined through intermarriage. Very few different surnames are represented in the Amish group.

5. The Amish show a great deal of residential stability. A large percentage live in the same county where their parents were born and, compared to non-Amish people, most family members live near one another.

6. The Amish have maintained control over outside influences, such as television and radio, by banning the use of electricity.

7. In many school districts, the Amish have been able to resist many of the influences of the public school. They have evaded state laws which would force their children to attend high school, and have fought the Compulsory School Attendance Laws.

**Conclusions:** The Amish value system, with its emphasis on "separation from the world" and "avoidance" brings about a social, as well as a cultural, isolation. The principle of avoidance is a major means of maintaining cultural and social stability within the group. Many Amish man-made regulations are functional when viewed as means of social and cultural control, and are usually connected to religious belief and the Scriptures.

Although the Amish are changing in various ways, they seem to have been able to withstand major sources of change by rejecting and banning the use of devices such as electricity and the automobile.

Because the Amish believe in "resisting the new", they have consciously resisted change. Although the sources of change have been increasingly greater in our industrialized society, the Amish seem to have been able to avoid many of them, and in spite of the changes that have taken place within the Amish subculture, it is quite probable that the rest of society has changed at a faster pace, leaving the Amish as unique and peculiar today as they were fifty years ago.

282 pages. \$3.53. Mic 56-2391

## A QUANTITATIVE ANALYSIS OF SUPREME COURT OPINIONS FROM 1921 TO 1953: A STUDY OF THE RESPONSES OF AN INSTITUTION ENGAGED IN RESOLVING SOCIAL CONFLICT

(Publication No. 16,730)

Eloise C. Snyder, Ph.D.  
The Pennsylvania State University, 1956

This study was an analysis of Supreme Court opinions from 1921 to 1953 to ascertain how the Court functioned in resolving the conflicts brought before it.

The first of two major objectives was to determine the degree of certainty or uncertainty with which the interpretations of constitutional amendments were applied to the dynamic American scene. It was found that, in general, these interpretations were applied with a relatively high degree of certainty; however, interpretations of amendments guaranteeing "civil liberties" were applied with a lesser degree of certainty than interpretations of the more "technical" amendments. The implication was that the "civil rights" amendments require more discretion for their interpretation, for it is not always easy to determine what a person's rights are when they are allegedly violated in new and unusual circumstances.

The second major objective was to determine the impact of the contemporaneous social forces upon the Supreme Court. It was found that although the Court attained a high degree of consensus in its interpretations of amendments, there was a definite trend toward a lesser consensus. The period from 1921 to 1937 was one of high consensus during which the Court was very stable and relatively "conservative" in its decision-making. The period from 1937 to 1946 showed a decline in the degree of consensus. This was believed to have reflected the introduction of the "newer" ideologies brought to the Court by the Roosevelt appointees. The third period, from 1946 to 1953, displayed the lowest degree of consensus. This was felt to have resulted from the many social dislocations brought about by World War II. Also, this trend toward a declining consensus, generally, could have resulted from the progressively more difficult and complex cases being brought to the Court. The declining consensus could not be interpreted as the result of irresponsibility or caprice on the part of the justices, since the application of the Guttman scaling technique to the consensus-dissent opinions showed that each justice was responding to the conflicts in a manner which was consistent with a well delineated frame of reference.

Despite the high consensus displayed by the Supreme Court, it was found to contain three distinct coalitions of justices. Two of these tended to be in mutual opposition and were called "Clique A" and "Clique B", respectively. The third, voting sometimes with "Clique A" and at other times with "Clique B", was called the "Pivotal Faction." This analysis appeared to show that some justices remained on the bench long after their ideologies had become outmoded and that a few justices were appointed before their ideologies had been assimilated by the Court. Most of the newly appointed justices, however, tended to be members of the Pivotal Faction during their initial courts and dissented less frequently than the other members of the Court.

The Supreme Court tended to favor the litigant classified in this study as having superior status and/or power although this tendency appeared to be declining. This was

felt to imply that the superior litigant had the better means of presenting his case or that he took cases to the Court only when he was relatively certain of winning. The decline in his ability to win may have implied an actual status change of the litigant types.

The Supreme Court affirmed only slightly more of the lower courts' opinion than it reversed. This might appear to reflect a dangerous discontinuity between the two court levels; however, it was felt to be the result of the Supreme Court's attempt to interpret constitutional amendments as flexibly as the values of the society demanded.

#### VITA

Eloise C. Snyder was born on May 13, 1928 in Hazleton, Pennsylvania. She attended the Hazleton public schools and was graduated in 1946 from the Hazleton Senior High School. In 1952 she received the Bachelor of Arts degree from Lycoming College, Williamsport, Pennsylvania; the Master of Arts degree from The Pennsylvania State University in 1953 and the Doctor of Philosophy degree in 1956 from The Pennsylvania State University.

111 pages. \$1.39. Mic 56-2392

#### THE IMPACT OF RETIREMENT

(Publication No. 17,012)

Wayne Edwin Thompson, Ph.D.  
Cornell University, 1956

This thesis is based upon the data of the Cornell Study of Occupational Retirement, a longitudinal study which has been underway for nearly four years.

Chapter I outlines the problem of aging and retirement and presents several hypotheses concerning the effects of retirement which can be found within the literature of social gerontology. The present study takes the position that there is no single effect of retirement on the individual apart from the creation of a problem of readjustment. Rather, the effects of retirement are considered to be dependent upon a great many factors, some of which may be incidental to retirement as such. Chapter II discusses the study design and indicates the extent to which the respondents are representative of America's population of like age.

The question of why people retire is discussed in Chapter III, partly as a matter of interest in its own right, but primarily because it is hypothesized that why people retire to a large extent provides the meaning of retirement and so affects adjustment in important ways. Considering simultaneously working status, pre-retirement attitude toward retirement and, among the retired, who decided retirement should occur, six retitant types are created: willing and reluctant voluntary retitants; willing and reluctant administrative retitants; and non-retitants either willing or reluctant to retire. This typology is used throughout the remainder of the analysis.

Retirement at sixty-five is found to be almost entirely limited to employees of private industrial concerns and primarily is a result of administrative retirement programs. Most of the remaining retirement is an expression of a favorable pre-retirement attitude toward retirement. In turn, a favorable attitude reflects the independent

and cumulative influence of having plans for retirement, expecting a relatively large retirement income, home ownership, poor health, difficulty keeping up with the work, and dissatisfaction with work and the job.

Chapter IV consists almost entirely of a panel analysis of the effects of retirement. Differential changes among the retired as compared with the employed are found in the following: increased difficulty in keeping occupied; decreased income and increased economic deprivation; decreased interaction with friends; decreased satisfaction with life; and increased dejection. Increases in dissatisfaction with life and dejection are largely attributable to increased economic deprivation. In every case, the reluctant retitants are more likely than the willing to have become less well adjusted.

No differential changes were found in hopelessness, interaction with children and grandchildren, self image regarding age, loneliness and, of particular interest to gerontologists, health. Evidently poor health leads to retirement, but retirement does not lead to poor health. Overall, it would appear that the negative impact of retirement has been grossly overestimated.

Chapter V discusses adjustment in retirement specifically. It is found that difficulty in not working and dissatisfaction with retirement can almost entirely be accounted for by three variables: (1) an unfavorable pre-retirement attitude toward retirement; (2) economic deprivation; and (3) difficulty in keeping occupied. The pre-retirement attitude plays a particularly important part, for whether the retitant will feel deprived and will find it difficult to keep busy depends in considerable measure on his pre-retirement orientation to retirement.

The final chapter summarizes the findings of the study and attempts to define more precisely the problem of retirement. The several hypotheses ennumerated in the first chapter are discussed in light of the findings; and the chapter concludes with suggestions for further research in this phase of social gerontology.

221 pages. \$2.90. Mic 56-2393

#### SOCIOLOGY, FAMILY

##### THE RELATION OF PARENTAL ACCEPTANCE TO ADJUSTMENT OF CHILDREN

(Publication No. 17,381)

Lee Garwood Burchinal, Ph.D.  
The Ohio State University, 1956

The object of the study was to determine what relationship exists between parents' acceptance of their children and the personal - and social - adjustment characteristics of the children.

The Porter parental-acceptance scale and the Rogers test of personality adjustment for children were used to measure the variables studied. One score is derived from the acceptance scale, and four subscores and a total score are obtained from the adjustment test. These schedules were administered to a sample of 256 sets of parents and their fifth-grade children. The ages of the children were held constant in order to facilitate the development of a practical sample design and to gain some control over the measurement of the variables.

Because children are regularly assembled in schools and are readily accessible, they were used as the basis for the selection of the families comprising the sample. A stratified probability sampling design was developed, based on the selection of fifth-grade class units as sampling points. Four states, Iowa, Kansas, Ohio, and Wisconsin, were the primary areas of sample selection. In each state two strata of population, rural and cities in the 2,500 to 10,000 population range, were defined. Eight sampling points, divided proportionately between these two strata according to their population sizes, were selected by a probability method for each state sample. Eight children, and hence families, were randomly drawn at each sample point from a group of families defined as meeting the criteria of the sample. To be considered eligible for possible selection, families had to include both parents and at least two children. Thus, each state sample consisted of 64 families, and the total sample included 256 families.

The children completed the Rogers test in their classrooms. Home interviews were used to obtain the parents' responses to the parental-acceptance scale. Approximately 80 per cent of the originally selected families cooperated in the study. The remainder of the sample was made up of alternate families also drawn at random from the various sample points.

To test the hypothesis that parents' acceptance scores and the children's adjustment scores were associated, fathers' and mothers' acceptance scores were correlated separately with each of the children's five adjustment scores. The relationships between the children's scores and combined parents' acceptance scores, determined by sums and differences, were also calculated. All of these correlation coefficients were calculated separately for each state sample and for the total sample of families. In all, 100 correlation coefficients were computed; eight were statistically significant, but three of these indicated an association opposite in direction from what had been expected. Only two of the significant correlation coefficients were found for the total sample analyses, and these were very low:  $r = .139$  and  $r = -.132$  ( $P < .05$ ). The hypothesis was not supported by the analysis of the data.

Two alternative conclusions were considered for the study: (1) there was no statistically significant relationship among the variables; or (2) the failure to demonstrate any significant relationship was due to inadequate measurement of the variables. Tentative acceptance of the second conclusion was based on the evaluation of the findings of relevant studies and commonly accepted theoretical formulations relating to the personality development of children.

107 pages. \$1.50. Mic 56-2394

#### SOCIOLOGY, PUBLIC WELFARE

##### A PHILIPPINE BARRIO: A STUDY OF SOCIAL ORGANIZATIONS IN RELATION TO PLANNED CULTURAL CHANGE

(Publication No. 17,006)

Agaton Palen Pal, Ph.D.  
Cornell University, 1956

The Philippine government has started a nationwide program to improve the social and economic conditions of the barrios (villages). This program necessitates the in-

roduction of new technologies. The promotion of the acceptance of technological changes with a minimum of social disorganization among the barrio people is the problem of this study.

#### - I -

The introduction of new technologies into the barrio involves a number of variables, among which are:  $X_1$  - the agent of change,  $X_2$  - the nature of change,  $X_3$  - the method of introducing change, and  $X_4$  - the people to whom the change is to be introduced.  $X_1$ ,  $X_2$ , and  $X_3$  are relatively easier to vary and to control than  $X_4$ ;  $X_1$  can be chosen on the basis of desired qualifications,  $X_2$  can be modified in form, meaning, and/or function, and  $X_3$  is flexible.

The manipulation of  $X_4$  is restricted by the democratic philosophy of the country which puts primacy on the welfare of the individual citizen. Therefore,  $X_1$ ,  $X_2$ , and  $X_3$  should be adapted to  $X_4$ . This approach requires a thorough understanding of  $X_4$ .

#### - II -

The case study of a barrio reveals that:

1. The basic economic problem of the barrio is low production per unit area of land. This is due to antiquated agricultural methods and diminishing fertility of the land.
2. The barrio is a gemeinschaft social group. This characteristic is maintained by the common occupation of farming, low mobility, isolation from means of transportation and communication, common religious beliefs, and strong kinship ties.
3. Every extended kinship has two or three persons who are looked up to by the others as the origin of permission or influence.
4. Most influential persons in the town are ceremonial kinsmen of many families in the barrio. These persons function as the "first gatekeepers" of the barrio.
5. Beyond the kinship circle, there are persons in the barrio who are origins of permission or influence for certain activities. These persons are: the traditional doctor, the midwife, the Hermano Mayor (Fiesta Committee Chairman), the barrio lieutenant, and the teachers. These persons constitute the "second gatekeepers" of the barrio.
6. There are several occasions when the people are gathered together. These gatherings latently function as mechanisms for the diffusion of ideas in the barrio. Some of these occasions are: the barrio fiesta, marriage, death, market day, and group work.
7. The diffusion of ideas operates on a person-to-person basis. Each sex category serves as a vertical channel and each age category as a horizontal channel in the transmission of ideas.
8. The cultural changes between two generations have been more in technology than in ideology. These changes are in the form of modification of, or addition to, the existing cultural traits.
9. One category of likely acceptors of change is those who have had four or more years of formal education. The other category is those who have the characteristic of curiosity.

10. In the philosophical outlook of the people, they perceive their welfare as subject to the pleasure or displeasure of supernatural beings. Their efforts to attain their welfare are oriented to making harmonious adjustments to, and propitiating, the supernatural beings.

- III -

A barrio development program is formulated on the basis of the findings about the barrio. The desired qualifications of an agent are chosen in terms of personal attributes which make for effective dealing with the people. Technologies to be introduced are also chosen in terms of the cultural base of the barrio. Likewise, the methods of introducing the changes are designed to utilize the endorsement and cooperation of the "gatekeepers" of the barrio, and to make use of local mechanisms for the diffusion of ideas.

434 pages. \$5.55. Mic 56-2395

**THE RELATIONSHIP OF THE PUBLIC AND PRIVATE AGENCIES IN THE FOSTER CARE SYSTEM OF NEW YORK CITY FROM 1915 TO 1955**

(Publication No. 16,602)

Victor Rubenstein, Ph.D.  
New York University, 1956

The purpose of this study was to investigate the nature of the developing relationship between public and private agencies jointly responsible for foster care of dependent and neglected children in New York City from 1915 to 1955. An analysis was made of the trends, forces, and factors in the city's relationship to the private foster care agencies. Under this collaborative system of foster care government responsibility for the direct day by day care of these children was delegated to the private, sectarian agencies and institutions. In turn, the city determined the minimum standards of care and service to be given by these organizations and contributed financially to the cost of care. The study offered an unusual opportunity to see what happened when basic conflicts were precipitated around the issue of control where public money was granted to sectarian, voluntary organizations.

Several specific interrelated phases were investigated in order to discover and analyze the trends associated with the public-private agencies' developing relationship. These included: an account of the legal and administrative provisions, identification of the social and psychological principles underlying operation of the foster care system, discovery and identification of forces and factors associated with changing standards of care, as well as major areas of intergroup conflict and agreement between public and private agencies. In addition to an examination of primary and secondary sources, interviews were held with key people, including representatives of the Department of Welfare and sectarian foster care agencies. The data thus obtained were classified under six general types of forces and factors: social, economic, political, religious, financial and mental hygiene.

The study indicated that there was basic conflict between the public and private agencies relative to their re-

spective roles in the joint program. It revealed the tenacity of a system which did not meet the requirements of all children needing foster care. The government, affirming its accountability for dependent and neglected children, repudiated the isolationism and spirit of complete autonomy manifested by many of the private organizations caring for public charges. In turn, the sectarian agencies experienced the assumption of governmental activity as a threat to their existence. The conflict was centered on such issues as adequate coverage, levels and types of service, criteria for financial reimbursement, and the question of direct public service. Also, despite markedly declining case loads, there were insufficient long term private foster care facilities. In this situation, government and private agencies struggled to maintain and affirm their respective roles and power. Pressure to resolve the dilemma intensified two opposing forces. It tended to accelerate the attempts of the more advanced sectarian agencies to revise or expand their programs to meet changing needs. And, on the other side, it gave momentum to forces supporting the premise that responsibility for care of dependent and neglected children was a direct governmental function, not to be delegated to another agent. Fundamental modifications within the public-private system took place when overall community pressure sustained the taking of action to fill an unmet need.

The extent to which the whole community was conscious of need and supported change tended to be a direct factor in advances within the New York system of foster care. The basic hypothesis of the study was thus supported in that whenever crucial change took place in the relative positions of the public and private agencies, in the process of growth of the foster care system, it was met by each group's resistance to giving up the status quo, change being precipitated when overall community forces required it.

377 pages. \$4.71. Mic 56-2396

**SCHOLARSHIP AID IN SOCIAL WORK EDUCATION**

(Publication No. 17,088)

Milton Wittman, D.S.W.  
Columbia University, 1956

This study was undertaken to provide a critical analysis of the functioning of scholarship aid as it affects graduate students in social work, social work education, and social welfare in the United States. The design provided for the accumulation and evaluation of data obtained through the questionnaire method. As a basis for the inquiry, three questions were posed: (a) is current scholarship aid sufficient to its task? (b) does a demonstrable degree of financial hardship exist among students who receive no scholarship aid? and (c) do existing policies in scholarship aid programs tend to defeat their stated purposes by restrictions on recipients and conditions of acceptance?

The sources of the data were: (a) a random sample of 820 full-time graduate students drawn from a population of 3,616 in May 1954; (b) the fifty-two accredited graduate schools of social work in the United States; and (c) ninety-two social and health agencies, public and private, at federal and national, state, and local levels. The student questionnaire provided data on personal characteristics,

career objectives in social work, family background, financial status and experience, and attitudes toward aid. The schools and agencies provided data on scholarship aid.

Three primary criteria were found to obtain in the award of scholarship aid: financial need, recruitment, and ability. The latter two may be applied regardless of need. The primary goal of most agencies is the recruitment of personnel. Agencies with long-standing programs report generally satisfactory experience with the use of aid as a means of recruitment. A major objection of the schools and students was directed toward the policy of commitment for service in return for support.

The estimated total costs to a single student of a year in residence in graduate education in social work are between \$1,600 and \$2,000. There were 566 (69 percent) students receiving 659 grants with a median amount of \$1,215. For a nine-month school year, the students reported a median income of \$1,386 and median expenses of \$1,530. Reported expenses were lower than estimated expenses; 20 percent of the sample lived at home. Forty-four percent of the grants were under \$1,000; 43 percent between \$1,000 and \$1,999; 13 percent were \$2,000 or over. Forty-six percent of the students listed aid as their primary source of income. Seventy-two percent of the aid group reported some gradation of financial difficulty as compared with 57 percent of the non-aid group. However, a number of the latter were in the low-income group and reported serious financial difficulties. Conversely, a number of high-income students were in the aid group. Over half of the aided students stated they could not have entered professional education without help.

Some of the additional findings are: (a) aid resources lack flexibility needed to meet needs of married students and emergency needs; (b) the university aid resources are at a very low financial level compared with those from specialized fields; and (c) some schools believe that the sizable grants in the specialized fields have a negative influence on sound educational planning.

The major recommendations emerging from this study call for: (a) development of a philosophy of scholarship aid which can be used as a basis for improvement of present policies; (b) a national scholarship system for graduate education under Federal auspices; (c) action by the Council on Social Work Education to establish a committee on scholarship aid to improve, coordinate, and extend the present system; and (d) additional research on financial factors as a barrier to entering social work education, on students who discontinue training for financial reasons, and follow-up of aided students to determine the role of aid in selection of field of practice.

203 pages. \$2.65. Mic 56-2397

## SOCIOLOGY, RACE QUESTION

### TEACHERS IN NEGRO COLLEGES (A SOCIOLOGICAL ANALYSIS)

(Publication No. 17,084)

Daniel Calbert Thompson, Ph.D.  
Columbia University, 1956

#### Introduction

In some respects this may be described as the first comprehensive analysis of the career patterns of teachers

in colleges for Negroes. Throughout attention is focused upon the ways in which the career patterns of the Negro teachers differ from that of their white colleagues, and the career patterns of both racial groups in Negro colleges are compared, when possible, with the career patterns of teachers in "white" colleges.

Wide use is made of four kinds of material: (1) literature on the occupational culture of teachers in higher education; (2) observations of the author as a former student in three Negro institutions of higher education, and as a teacher in Negro colleges for ten years; (3) interviews with 50 teachers in 30 different Negro colleges; and, (4) a mailed questionnaire consisting of 96 questions which was filled out and returned by 1,110 teachers in 53 Negro colleges.

#### The Recruits

A third of the teachers in the sample are female. Approximately 11 per cent are white. The median age of all the respondents is about 40.

Three-fourths of the Negro teachers and just one-fourth of their white colleagues were born in southern or border states, and more than half of the Negro teachers and only a third of their white colleagues come from lower socio-economic backgrounds.

The great majority of the Negro teachers had to work their way through college and graduate school or depend heavily upon scholarships and fellowships. Only about one Negro college graduate in a thousand goes on for a doctorate compared with about two in a hundred for white college graduates.

#### Professional Duties

Teaching. Most teachers in Negro colleges have heavier teaching loads than regarded as normal by college rating agencies and academic societies. This may be the primary reason why about two-thirds of them tend to maintain low or flexible academic standards in their classes.

Research. Although about half of the respondents indicated that they were engaged in some kind of research at the time of the study — only 26 per cent of the white teachers and 17 per cent of the Negro teachers had contributed anything to published literature in a five-year period. Their productivity is considerably lower than that of teachers even in the "lesser" white colleges where 32 per cent are publishers.

Administration. In spite of the high value placed upon administrative positions by Negro teachers, in most cases all administrative offices in these colleges are subordinate to the president who usually delegates authority personally and often arbitrarily.

#### Rewards

Professional Advancement. Most of the respondents are critical of promotion policies in their colleges. Analysis of actual promotion practices suggests that a good deal of the criticism is well-founded and may be an important reason for what some believe to be low morale among teachers in Negro colleges.

Salary. The median salary of all teachers in the sample is \$3,971. For those who are employed for the nine-months term it is only \$3,456. For those employed for

ten months or more it is \$4,363. Only three per cent earn \$7,000 and over.

Though the difference is not always great or consistent, teachers in Negro colleges generally receive lower salaries than teachers in "white" colleges of similar size and type.

#### Social Status

Since Negroes tend to place high value upon education, and there are relatively few highly educated Negroes,

practically all Negro college teachers are believed to be accorded upper class status.

When asked to rate themselves according to social class only 11 per cent of the Negro teachers and 10 per cent of the white teachers actually selected the upper class as best descriptive of their social status. The vast majority, like Americans generally, indicated that they belonged to the middle class.

223 pages. \$2.90. Mic 56-2398

## SPEECH - THEATER

### THE EFFECT OF SPEECH ON METABOLISM: A COMPARISON BETWEEN STUTTERERS AND NON-STUTTERERS

(Publication No. 17,394)

Robert Lee McCroskey, Jr., Ph.D.  
The Ohio State University, 1956

The purpose of the study was to investigate the effect of speech on metabolism, with particular emphasis on the comparison of stutterers with non-stutterers.

Three consecutive measures were taken on each subject on each of two separate occasions. These measures were: (1) a basal metabolic rate, (2) a speech metabolic rate, and (3) a post-speech metabolic rate. The subjects were twenty stutterers and twenty non-stutterers. Nine of the stutterers had completed a therapy program, and the remainder were currently receiving therapy.

All conditions normally required for obtaining a basal metabolic rate were adhered to in the study. The experimenter administered all tests and used the same equipment throughout the experiment. The Benedict-Roth Metabolism Apparatus was adapted, by replacing the standard mouth-

piece with a full-faced army gas mask, to permit a measure of oxygen consumption during speech.

Results of the analysis of the data may be summarized as follows:

1. There is no significant difference between the stutterer and the non-stutterer with respect to basal metabolic rate.
2. The speech act results in a significant increase in metabolism over the basal metabolic rate for normal speakers.
3. The speech act results in a significant increase in metabolism over the basal metabolic rate for stutterers.
4. Stutterers (including those who had completed therapy and those who were currently enrolled in a therapy program) did not differ significantly from the normal speakers with respect to differences between their basal and speech metabolic rates.
5. Stutterers who have completed a therapy program show a significantly smaller rise in metabolism during speech than do those who are in the early stages of therapy.
6. There is no difference between the effect of speech on the metabolism of the normal speaker and its effect on the stutterer who has completed therapy.

49 pages. \$1.50. Mic 56-2399

## ZOOLOGY

### A STUDY OF CERTAIN ASPECTS OF THE PRECIPITIN REACTION AND ITS USE IN PROVIDING EVIDENCE FOR SYSTEMATIC RELATIONSHIPS AMONG BIRDS

(Publication No. 16,672)

Thomas Kenneth Richard Bourns, Ph.D.  
Rutgers University, 1955

The objectives of this study were to explore the usefulness of precipitin testing as a means of providing evidence for systematic relationships among birds, and to apply serological methods to an actual problem of bird taxonomy.

Antigens representing avian species were serum, dried

blood-dot extracts, or formalized muscle extracts. Antisera were prepared in mixed-strain laboratory rabbits. Precipitin turbidity was measured throughout the range of reaction in the Libby Photron-reflectometer. Degrees of relationship were based on the sums of turbidities obtained, using the homologous reaction as standard of reference.

Results showed that spontaneous cloudiness developed in bird antigens diluted in 0.2% and 0.85% saline. This was prevented by using a diluent of 3.0% or 5.0% saline, or 0.85% saline containing 2.0% human albumin. The latter exerted little effect on the precipitin reaction, but increases in salinity depressed precipitin turbidity. Optimal pH was 7.2 to 7.4. Avian antigens differ in reactivity as witnessed by the fact that correspondence between

two antigens may change markedly through a two hour period. Tests involving the three kinds of antigen from a given species and antisera made to each did not show absolute equivalence in any case. Discrepancies also resulted when old muscle extracts were compared with freshly prepared ones. Investigation of the range of serological reactivity under conditions chosen revealed that reactions could be obtained in testing Ostrich, Albatross, Penguin, and Chicken against strong anti-Passeriform antisera. The results of these tests would suggest that the Ostrich and Albatross are more closely related to the Passeriformes than is the Chicken. A series of tests involving six species of North American thrushes indicate that the Wood Thrush is more closely related to the American Robin than it is to the Olive-Backed Thrush, Gray-Cheeked Thrush, Hermit Thrush, or Veery.

The following conclusions were drawn from this study:

1. Avian antigens do not exhibit stability characteristics similar to comparable mammalian proteins. It is suggested that lipid components and/or inter-protein reactions may be responsible for the unusual behavior of bird antigens.
2. Spontaneous antigen clouding may be prevented by increasing the salinity of the diluent to 3%, a method which also depresses precipitin turbidity, or by the addition of 2% human albumin, which does not interfere with the greater part of the precipitin reaction.
3. Since avian antigens may show different degrees of avidity for a given antiserum, it is advisable that a minimum of two hours incubation be used in order to allow the less avid reactions to reach comparable stages of completion.
4. Interchangeable use of serum, extracts of muscle or dried blood-dot, and of similar antigens of different ages, may lead to errors of interpretation and should be avoided whenever possible.
5. Strong antisera are capable of reacting with antigens from the most diverse species tested.
6. The Galliformes appear to be among the most primitive of living birds.
7. The Wood Thrush is more closely related serologically to the American Robin than it is to the Olive-Backed Thrush, Gray-Cheeked Thrush, Hermit Thrush, or Veery.

78 pages. \$1.00. Mic 56-2400

human fractions were used as the basic materials for study.

Limitations of serum agar methods and an investigation of 12 variables in the procedures helped in standardization.

Two dimensional diffusion of proteins in the plate procedures of Jennings (triangular plate) and Ouchterlony are believed to be useful for screening antigens and/or antibody response. A modification of the triangular plate was devised for use in 9.0 cm. Petrie dishes.

Plasma Fractions I, II, II-3, III, III-2, IV-4, V were reacted with homologous and heterologous short injection series rabbit antisera. Considerable interaction was evident. Because of their therapeutic importance, Fractions II and V were subjected to special analyses. Minute absorption and mutual dilution methods utilizing these fractions suggested the existence of two "species" of albumin-globulin conjugates in gamma globulin. Fraction V and Normal Serum Albumin (Human) were essentially similar, each containing two albumins of different concentration and probably unlike in antigen specificity.

Comparison of turbidimetric precipitin curves by Libby Photron-reflectometer with procedures of Boyden et al indicated that this technique and serum agar columns are equally as sensitive and discriminating for systematic analysis of plasma fractions.

A Photron'er accessory device to accurately quantitate density and diffusion of zones of precipitation in agar columns was developed. The determination of unknown protein fractions by graphic plots of zone characteristics with this Serum Agar Measuring Aid (SAMA) seemed a possibility.

A serological approach to quantitation of cholesterol protein conjugates in hyperlipoproteinemic dog sera suggested the possibility of estimating lipoprotein concentration of ultracentrifuged top fraction subfractions by agar diffusion methods. Discrimination between zonal phenomena of hyperlipoproteinemic dog sera and normal dog serum when diffusing into antinormal dog sera appeared a possibility if SAMA graphs or agar column profile charts were constructed.

Basic details of the principles and use of the Serum Agar Measuring Aid, together with an analysis of the operation of Photron-reflectometer Model 570-151 to which SAMA was adapted, are included in the study.

195 pages. \$2.44. Mic 56-2401

**A COMPARISON OF THE TURBIDIMETRIC AND SERUM AGAR PROCEDURES FOR (1) THE DETERMINATION OF THE HOMOGENEITY OF HUMAN PLASMA FRACTIONS, AND (2) A SEROLOGICAL APPROACH FOR THE IDENTIFICATION OF CHOLESTEROL-PROTEIN CONJUGATES IN HYPERLIPOPROTEINEMIC DOGS**

(Publication No. 16,677)

William Grant Glenn, Ph.D.  
Rutgers University, 1956

The recent interest in serum agar methods for determining the protein components or inhomogeneity of soluble antigens warranted a comparison of immunoprecipitation with validated turbidimetric precipitin procedures. Seven different commercially prepared ethanol precipitated

**STUDIES ON THE EMBRYOLOGY OF THE MINK**

(Publication No. 17,390)

Abbott Theodore Kissen, Ph.D.  
The Ohio State University, 1956

Presumably, the dissertation is the first general study of the developmental anatomy of mink recorded in literature.

Individual variation in time of implantation of ova in bred females makes impossible the recovery of series of embryos consistent with age. Therefore, combinations of anatomical features in available mink embryos have been matched with those of Streeter's series of human embryos from his "Horizons" I through XVIII.

Thirty-five mink embryos from 13 females allocated to 13 horizons are described.

Horizon I. Zygote; one cell. (Enders)

Horizon II. Early blastocyst, segmentation cavity. No inner cell mass.

Horizon III. Free blastocyst; antimesometrial inner cell mass; entodermal cells line inner cell mass; zona pellucida.

Horizon IV. Appearance of mesoderm; bilaminar blastocyst.

Horizon IX. Neural groove; head fold; fore-gut; oral membrane; approximately 4 somites; paired tubular heart but fusion imminent.

Horizon X. Fusion of neural folds in cranial two-thirds of embryo; 10-13 pairs of somites; hind-gut anlage; pronephric tubules, ducts from 6-12 somites; optic vesicles; somites differentiation.

Horizon XI. Anterior neuropore disappearance, posterior neuropore persistence; 2 pharyngeal pouches; mandibular, hyoid bars; V, VII-VIII ganglia.

Horizon XII. Three branchial bars; bifurcation of first bar into maxillary, mandibular processes; posterior neuropore closure; Rathke's pouch; thyroid depression; liver diverticulum; right and left bronchial stems; otocyst closed; arm bud primordium; mesonephric ducts empty into cloaca.

Horizon XIII. Arm and leg buds; arm bud pronounced ridge; median thyroid conspicuous; primary bronchi; gall bladder primordium; dorsal pancreas; thickened retinal disc, optic cup, and endolymphatic appendage formation.

Horizon XIV. Arm buds projecting appendages; leg buds finlike; third branchial bar disappearance into cervical sinus; faint subdivision of hyoid bar; thyroglossal duct disappearance; trachea detached from esophagus; pulmonary veins; ventral pancreas; well-developed mesonephros; lens indentation; beginning pigmentation of retinal layer.

Horizon XV. Arm bud differentiated into distal hand and proximal arm and shoulder segments; leg buds definite projecting appendages; infundibulum; secondary bronchi; ureter and pelvis of kidney formation; epithelial keel joins ventral aspect of nasal sacs with roof of mouth; lens vesicle closed.

Horizon XVI. Hand segment differentiated into carpal part surrounded by digital plate; auricular hillock precursors; posterior lobe of hypophysis; secondary bronchi subdivision; dorsad migration of ventral pancreas; separation of bladder from rectum caudal to ureters; primary plate primordium; vomeronasal organs as pair of grooves; otic vesicle elongation.

Horizon XVII. Definite auricular hillocks; finger ray indication; digital plate of leg bud barely distinguished from tarsal region; hypophyseal stalk lumen partially present; caecum; kidney collecting tubules; cleavage of epithelial keels of nasal sacs; nasolacrimal duct primordium; epiphysis; beginning semicircular canals; hyaloid artery; mesoderm proliferation between lens margin and surface ectoderm.

Horizon XVIII. Eyelid rudiment; fusion of some auricular hillocks, distinct finger rays, and interdigital notches; toe rays and faint indication of interdigital notches; hypophyseal stalk as slender epithelial stem; branching calyces, choanae formation; vomeronasal organs caudally directed, blind sacs; 3 semicircular ducts; L-shaped cochlear duct; portion of lens wall invaginating; lens fiber.

Mink embryonic development is typically mammalian.

It parallels human development organogenetically except in relative timing of differentiation of particular features. After Horizon XVIII marked divergencies between mink and man indicate the need for specific criteria in proper staging of mink embryos. 98 pages. \$1.50. Mic 56-2402

#### HOW SEA STARS OPEN BIVALVES

(Publication No. 16,656)

Marcel Elphege Lavoie, Ph.D.  
Syracuse University, 1956

For the past 60 years most zoologists have accepted the theory that sea stars reach the soft parts of bivalves by first opening the shell with pull applied to the valves by the tube feet. A few investigators have suggested, as an alternate theory, that the sea star produced a weakening of the victim's adductor muscle by means of a toxic secretion. To support this contention they cited experiments in which extracts prepared from sea star tissues induced tetanus in molluscan hearts. These two theories, the mechanical and the chemical, have been reexamined critically and experiments have been performed to determine their validity.

Extracts prepared in the cold from the various organs of feeding and non-feeding *Asterias forbesi* were introduced into the mantle cavity and the adductor muscle of *Mytilus edulis*. Each mussel was subjected to a pull of 800 grams on its valves for 45 minutes. Data from over 1000 tests indicate that such extracts did not influence the rate of shell opening more than similar injections of sea water. Thus, no toxic agent could be demonstrated in the extracts.

It was shown also that the adductor muscle of *Mytilus* can contract effectively for several days after excision of the heart. Therefore, it appears that any alleged toxin produced by the sea star could not exert its influence in the manner suggested by some proponents of the chemical theory. In addition, there was some evidence that the nervous system was not directly affected by the extracts used.

The pull exerted by the tube feet during predation was measured directly by substituting a steel coil spring for the adductor muscle of *Mytilus*. A manometer connected to the spring revealed forces of over 3000 grams. *Asterias* can insert its eversible stomach into the shell within 3 minutes after the pull begins and via an opening as narrow as 0.1 mm. The sea star's body generally does not move during this process so that the force needed for the pull must be derived from the tube feet's muscular tissues.

It is believed that these experiments provide definite proof for the force theory which heretofore had been accepted on the basis of indirect and unconvincing experiments performed by Schiemenz in 1895.

117 pages. \$1.46. Mic 56-2403

STUDIES ON THE LIFE HISTORY OF  
RICULARIA COLORADENSIS HALL, 1916  
(NEMATODA: THELAZIIDAE), A PARASITE  
OF PEROMYSCUS LEUCOPUS  
NOVEBORACENSIS (FISCHER)

(Publication No. 17,400)

Vernon Harvey Oswald, Ph.D.  
The Ohio State University, 1956

Ricicularia coloradensis, a spiruroid nematode, was found in the small intestine of 76.5 per cent of the white-footed mice, Peromyscus leucopus noveboracensis, collected at Rhododendron Hollow, located in the extreme northwest corner of Hocking County, Ohio, and in 17.4 per cent of the white-footed mice collected in the University Woodlot of the Ohio State University, Columbus, Ohio. Infected mice harbored from 1 to 10 (Av. 3) adult female worms, but only one male was found in a natural infection.

The larvae of R. coloradensis develop experimentally in a number of insect hosts. The larvae developed normally to the third infective stage in German roaches, brown-banded roaches, wood roaches (Parcoblatta spp.), field crickets (Acheta assimilis), and camel crickets (Ceuthophilus sp.). However, in oriental roaches, American roaches, ground beetles (Dicaelus sculptilis and Chlaenius sp.), and meal worms (Tenebrio molitor), the larvae underwent some development, but on or before the twelfth day of infection the cysts became pigmented, and the larvae were dead or dying. Eggs hatched in the sow bug, Trachelipus sp., but the larvae failed to develop.

Larvae of R. coloradensis were found under natural conditions in the camel cricket, Ceuthophilus g. gracilipes, at Rhododendron Hollow, and one larva was found in a wood roach, Parcoblatta virginica, at the University Woodlot.

The eggs of R. coloradensis, which are fully embryonated when laid, hatch in the midgut of the German roach, and the first-stage larvae enter the epithelium of the hind-gut within twenty-four hours after exposure to eggs. The larvae undergo two molts while developing within a cyst formed by the tissues of the host gut. In German roaches kept at room temperatures (72° to 80° F.), the first molt, giving rise to the second-stage larva, occurs during the seventh or eighth day, and the second molt, giving rise to the third-stage larva, occurs during the twelfth or thirteenth day. The larvae become infective to the definitive host as early as the tenth day of development.

In the definitive host, the third-stage larva molts and gives rise directly to the adult stage without the interpolation of a fourth-stage larva. This third molt occurs during the fifth or sixth day following the experimental infection of laboratory mice. This development forms an exception to the general rule of four molts in the life cycle of the Nematoda.

Males of R. coloradensis become sexually mature about ten days after infection of the mouse. Females mature on about the thirtieth day, but they do not begin to deposit eggs in the feces of the mouse until about the fifty-fifth day after infection.

In Peromyscus, the third molt, which gives rise to the adult, occurs about one day earlier (during the fourth day) than in the laboratory mouse. However, worms appeared to be unable to develop to maturity in captive white-footed mice kept under laboratory conditions. Larvae were unable to develop to the adult stage in white rats.

Variation in the taxonomic characters of adult R. coloradensis is documented and discussed, and this species is compared with the other North American species of the genus Ricicularia. 96 pages. \$1.50. Mic 56-2404

SURVIVAL OF INFECTIVE LARVAE OF SOME COMMON NEMATODES OF BEEF CATTLE ON FLINT HILL PASTURE IN KANSAS

(Publication No. 16,883)

Gurdasmal Alimchand Shivnani, Ph.D.  
Kansas State College, 1956

Survival and concentration of the eggs and infective larvae of some cattle nematodes were studied in dung heaps and on grass, in experimental plots, on a Flint hill pasture in Kansas. Similar studies were also conducted on an experimental plot on the campus of Kansas State College. These studies were undertaken May 22, 1954 through October 22, 1955.

Weekly and daily fecal samples were collected from the test plots. The viable larvae recovered from these samples, by means of a modified Baermann apparatus, were studied and total and differential counts were made.

Meteorological data were collected from a weather station installed in the vicinity of the pasture test plots.

Infective larvae were differentiated from free-living nematode larvae in the fecal and grass samples by mixing a 1:40 dilution of hydrochloric acid with samples containing larvae. The free-living soil nematode larvae were killed instantly, whereas, the parasitic nematode larvae were unaffected.

The genera and species of parasitic nematode larvae studied for their survival on pasture were Haemonchus contortus, Bunostomum phlebotomum, Trichostrongylus axei, Cooperia spp., Ostertagia ostertagi, Oesophagostomum radiatum and Nematodirus sp.

The summer experiments of 1954 and 1955 showed that a temperature of 90° F or higher and dryness of fecal pads, resulted in a high mortality of eggs and larvae. A great percentage of eggs was destroyed within 48 hours. A very low survival of the larvae was recorded during the summer experiments. Infective larvae survived longer in shaded areas than larvae in open sunlight. Nematodirus sp., and Oesophagostomum radiatum were found to be most resistant to summer weather conditions.

The results of the fall and spring experiments indicated that a temperature range of 50°-70° F was very favorable to the hatching of eggs and survival of larvae.

Freezing and sub-freezing temperatures, however, were found to accelerate the death rate of larvae. Longest survival of larvae was observed during the fall. The number of larvae per gram was much higher in the fall than in the spring.

Haemonchus contortus, Cooperia spp., Ostertagia ostertagi, Bunostomum phlebotomum and Trichostrongylus axei survived through the fall and winter season. Cooperia spp. were the most abundant and T. axei the least abundant.

Survey of pasture grass showed a definite increase not only in the number of positive samples but also in numbers of larvae during April and May followed by a decline in

July. There was a significant difference between the species of nematode larvae as well as the number of larvae recovered from different parts of grass blades and the location of grasses on a pasture. Cooperia spp., were significantly more abundant on the grass than any other species. The bottom third of grass blades was more heavily infested with larvae than was the top or middle thirds.

The results of daily fecal samples collected from the campus plot revealed a noticeable fluctuation in the larval counts. These fluctuations were probably associated with daily fluctuations in temperature throughout the seasons. The overwinter survival of species on the pasture was much longer than on the campus plot. Moisture content showed a significant correlation to the number of larvae per gram during the fall and the maximum air temperature showed a significant correlation during the summer months. Cooperia spp. and O. Ostertagi survived the longest and in the greatest numbers during the entire experiment.

The present study indicates that frequent scattering of dung heaps on pastures and feed lots during summer season and summer fallow would probably reduce the population of parasitic nematode larvae on Kansas pastures.

102 pages. \$1.50. Mic 56-2405

**THE EFFECT OF A GROWTH INHIBITOR  
(CORTISONE) ON SOME CHEMICAL CONSTITUENTS  
OF DEVELOPING CHICK LIVER**

(Publication No. 16,668)

John C. Weston, Ph.D.  
Syracuse University, 1956

The effect of a growth inhibitor (cortisone) on some chemical constituents of the developing chick liver was

studied in the following manner. One milligram of cortisone acetate (Merck) suspended in 0.3 ml. of normal saline was injected onto the chorioallantoic membrane at eight days of incubation. Embryos treated with 0.3 ml. of normal saline only served as controls. The study was conducted from nine through nineteen days of incubation and embryos were sacrificed at daily intervals.

The nucleic acids of the liver were extracted by the Schneider method and the amounts were determined using the Dische diphenylamine reaction for desoxypentose and the Bial orcinol test for pentose. Protein nitrogen and total nitrogen were determined by the method of Koch and McMeekin. Anthrone reagent was used to determine the glycogen content and the fat content was determined by staining with Sudan Black. Cell counts were made on homogenates of treated and control livers using a standard haemocytometer.

The following results were obtained: The treated livers were significantly smaller than the control livers after ten days of incubation. There was little change in the amounts of RNA, DNA, total nitrogen and protein nitrogen on a per cell or unit weight basis between control and treated livers. The number of cells per unit weight was significantly reduced in the treated livers on the fourteenth and fifteenth days of incubation. The total amounts per liver of RNA, DNA and cells were reduced in the treated livers after twelve days of incubation.

The amounts of glycogen per cell, per unit weight and per liver were significantly higher in the treated livers at eighteen days of incubation. No differences were observed in the amount of fat in treated and control livers during the interval studied.

These results are consistent with the hypothesis that cortisone inhibits nucleic acid synthesis in the developing chick liver and that this is reflected by a decrease in protein synthesis.

54 pages. \$1.00. Mic 56-2406

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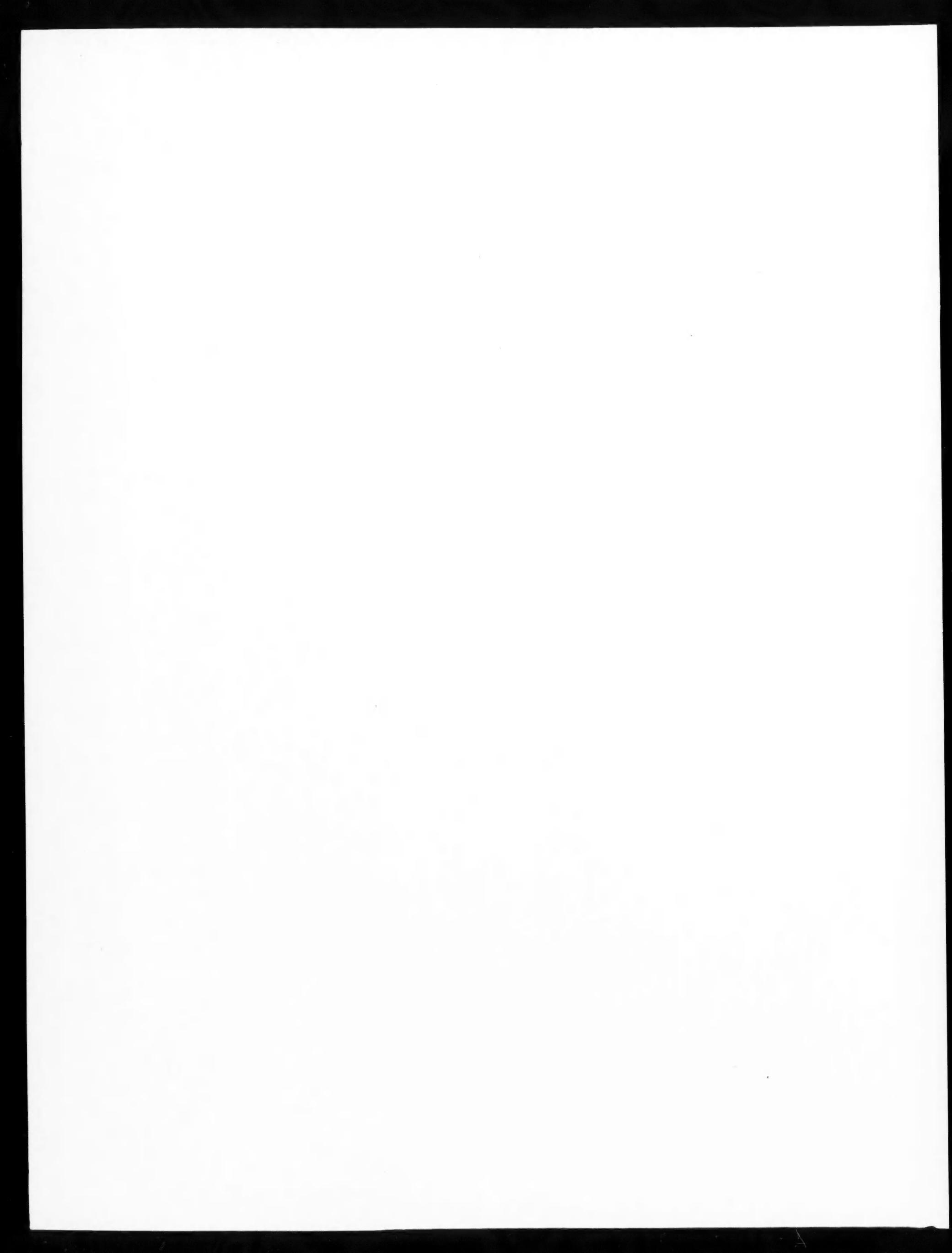
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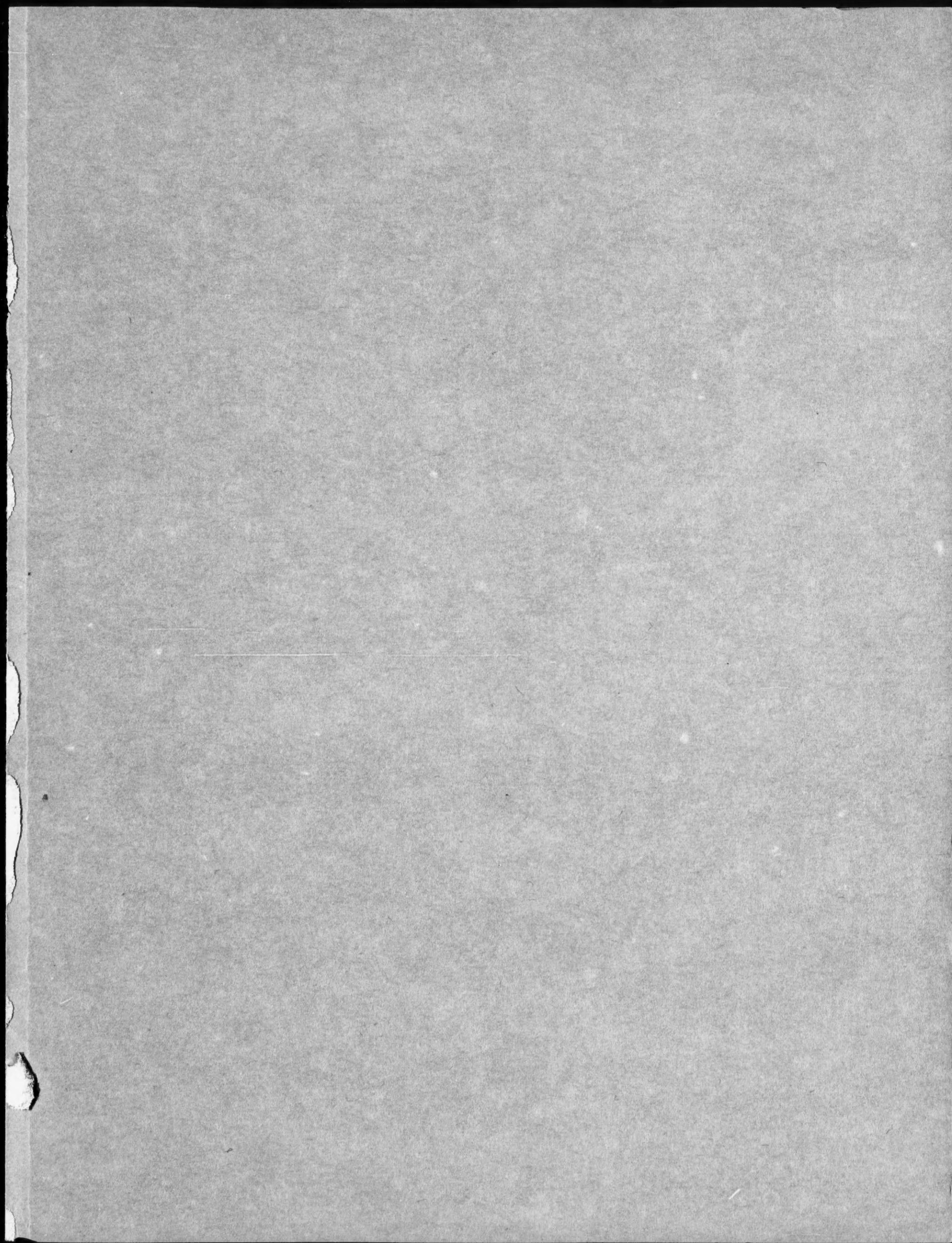
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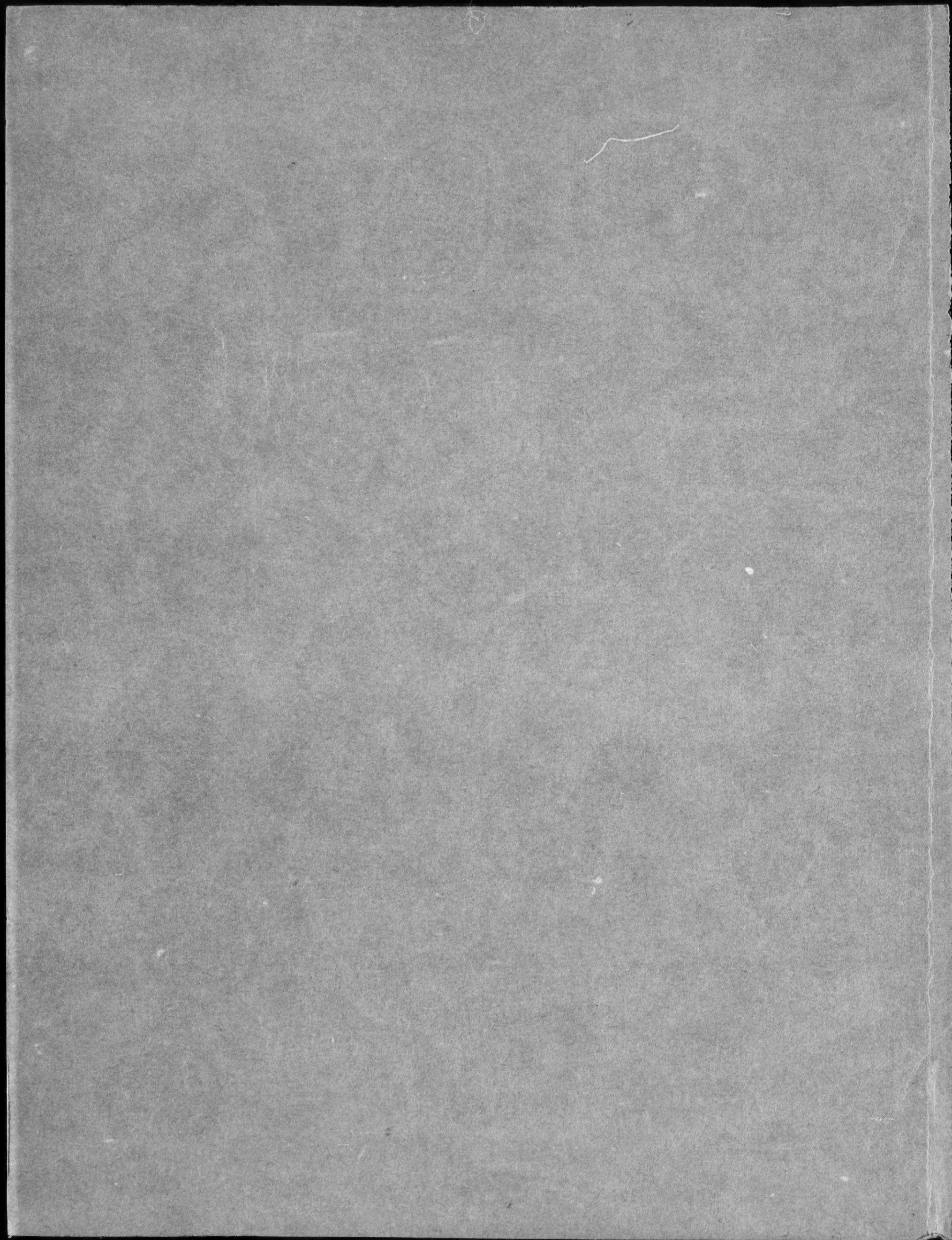
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